TEXT-BOOK
OF

INTERMEDIATE LOGIC
(DEDUCTION)

Containing Numerous Questions and Exercises

By

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or

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PREFACE

While revising the book for the present edition I have .ried to make it further useful to the Intermediate students of Deductive Logic in several ways. Besides improving the language and arrangement of the various sections, I have supplied concrete illustrations wherever they were wanting   In place of a meagre appendix on Indian Syllogism in the last two editions I have now devoted one whole chapter to the subject of Inference in Indian Philosophy in Part IV of the work. It will be a source of great satisfaction to me if, along with the study of Western Logic, my *Text-Books of Intermediate Logic* in their present form could now be utilized for introducing the students to the treatment of such allied problems in Indian Logic as Syllogistic Inference and the Law of Causation

<div align="right">J P.</div>

LIST OF ABBREVIATIONS

A U.—Allahabad University.

Intermediate Logic—An Intermediate Logic, by J. Welton, M A., and A. J. Monahan, M.A., London, 1911.

L , B. Sc.—London University, B Sc.

L , B A.—London University, B.A.

Mill's Logic—A System of Logic Ratiocinative and Inductive, by J. S. Mill

N. U.—Nagpur University.

P. U.—Punjab University.

S K.—*Sāmkhya-Kārikā,* by *Iśvarakrsna.*

S. T. K —*Sāmkhya-tattva-kaumudī,* by *Vācaspati Miśra.*

U I B.—The United Provinces Intermediate Board.

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PART I
GENERAL NATURE OF LOGIC

CHAPTER I

DEFINITION AND SCOPE OF LOGIC

1 DEFINITION OF LOGIC

Logic has been variously defined by different authors. The most accepted definition of Logic at present is that it is the science of the principles of correct thought, or more briefly, it is the science of knowledge We shall consider some other important definitions of Logic later on.   At present we shall just attempt an explanation of the definition given here   The first term to be explained in our definition is 'logic' itself   It has two meanings (*a*) thought, and (*b*) the word (or rather, phrase or sentence) which is the expression of thought   Thus the derivation of the name suggests that Logic might deal with both thought and the expression of thought   And in fact it deals with both of them.   It deals primarily with thought, and secondarily with language

Relation of Logic to Language —We have said that Logic deals secondarily with language   This means that while the chief subject of Logic is thought, the consideration of the various forms of language also, in so far as they are necessary for the expression of thought, falls within its scope Thought and language are related to each other as matter to form

The conception in our mind, for example, that a man possesses the attribute of rationality is thought, while the sentence 'Man is a rational being' is the expression of that thought in language.   We cannot think without the help of language, nor can we communicate our thoughts to others without that means.   So in order to deal with thought, which is its chief subject, Logic must also consider the forms of language which are necessary for the   expression of the various kinds of thought.   How far and in what way it does that, this we shall see later on as we progress in our study of the subject.

The Meaning of Science —The next term to be explained in the definition of Logic is 'science'   'Science' means knowledge   But what kind of knowledge?   A man in the street, we say, knows what a plant is.   A botanist, that is to say a man who studies the science of plants, also knows what a plant is.   Now, is the knowledge of a plant   which   these two kinds of men respectively have exactly of the same nature, or is it different?   A comparison of these two kinds of knowledge will show how immensely they differ   A man in the street knows a plant, but his knowledge of that is perhaps confined to a few most conspicuous aspects of it, —the trunk, the branches, the leaves and the most coarse outlines of the flower   On the other hand, the botanist knows a plant not only in its minutest and most complex details, but also sees the connection among them   This is achieved by following a *definite regular method of observation and experiment.*   The man in the street could not have studied plant in that regular way.   So the knowledge

of a plant as acquired by this man is ordinary and superficial, while that of the bontanist is special and deep,—that of the former, unconnected; while that of the latter, perfectly systematic. *Now this other kind of systematised knowledge is called science.* Science, firstly, *observes* the object which is to be known, and secondly, it *explains* it Explanation means showing connection among the different parts of a whole and also the relation of the whole to other objects. For example, a botanist will first observe the various parts of a plant, then he will see how they are connected with one another so as to form the plant as one whole, and finally, he will also find out how that particular plant stands in relation to other plants *Science differs from art, which is systematised action* Just as there may be two types of knowledge,—the one ordinary and unconnected, and the other special and systematic, so there may be two kinds of action, viz , the one, ordinary and unmethodical, and the other, special and skilful The latter kind of action is called art. *Every science results in some art* For example, the science of Anatomy results in the art of surgery, the science of Astronomy in the art of navigation, and so on Skilful action depends upon systematic knowledge In other words, art depends upon science.

Is Logic a Science or an Art?—We have defined Logic as a science of the principles of correct thought.   Some logicians have held that it is an art, that is to say, an art of correct thinking or reasoning According to this view, the function of Logic is to teach us how to think or reason

correctly, and also to find out if there are any mistakes in our own thinking and in that of others.   With regard to this controversy it may be said that while it is possible to use Logic as an art, it is primarily a science   For, in the first place, it aims at formulating and explaining the laws of thought, and this is the function of science.   Then an art of Logic might, as every other art does, result from the science.   But traditional Logic, as it has come down to us, and as we understand it, is really a science and not an art.

The Meaning of 'the Principles of Thought'—We have defined Logic as the science of the principles of thought. What does 'principles of thought' mean?   'Principle' means a law, and laws are those general conditions which are found to govern a certain kind of existence.   For example, we have the laws of a state and the laws of nature, so have we the laws or principles of thought too, by which we mean *those universal conditions which govern every act of correct thinking, and without which there could not be any knowledge*   This brings us to the consideration of the meaning and nature of thought itself, which is the subject of Logic.

The Nature of Thought—We say   we   think   What do we mean by that?   In every act of thinking there is always something about which we think, that is to say, there is always some subject or matter of our thoughts, e.g., we think about man, so as to find   out   what   kind   of   being he is   Now during the course of thinking we shall have several   things   to   say   about   man   as   our   knowledge about him grows.   One typical thought will be that man

is a rational being. So that in every act of thought we say something about the subject of our thoughts. The act of thought is called a judgment, and the expression of it in the form of a sentence is called a *proposition.* The term which denotes that about which something is said is called *the subject,* while the one which means what is said about the subject is called *the predicate.* The connection between the subject and the predicate is indicated by a verb, which, in Logic, is called *the copula* A judgment is the simplest act of thought, and therefore it has been called the unit of thought This means that we cannot think in the form of anything less than a judgment Even exclamations, such as Lo!, Look!, Here!, There!, Something!, etc., are really abbreviated judgments referring to the existence of the object towards which one's attention is drawn They stand for the judgments (*i*) It is there, (*ii*) It is here, (*iii*) Something is there, and so on. In every judgment we have some *ideas or concepts* which stand as the subject and the predicate These ideas or concepts are not to be supposed as existing independently prior to the judgment They are always found there as the elements contained in it Ideas or concepts and judgments expressed in logical language are called *terms* and *propositions* respectively

Now it is possible in thought that from the truth or falsity of a certain judgment we might draw an inference which is a little different in form and meaning from the original judgment, or from two judgments with a common term we might infer a third judgment For example, from

"All men are mortal" we can infer "Some mortal beings are men," or again, from the two judgments:

All men are mortal,

All Europeans are men,

we might infer a third judgment 'All Europeans are mortal.' This kind of process in thought is called inference. The inference of the first type, in which some conclusion follows immediately or directly from a judgment, is called *Immediate Inference;* while that of the second kind, where the conclusion follows from a judgment when it is combined with another one, is called *Mediate Inference.* There is still another variety of inference where from the observation and examination of particular instances we infer a general rule with regard to the relation of cause and effect. For example, by observing and examining the nature of the bodies of living beings we might infer the general principle that all living beings are mortal. Now this latter kind of inference has been called *Inductive Inference* in Logic; while the former, Mediate Inference, where we bring under a general statement or principle a less general case, is called *Deductive Inference.*

2. THE DIVISION OF LOGIC

Corresponding to the two kinds of inference the study of Logic has been divided into two parts *Deduction* and *Induction.* The part which deals with Deductive Inference is called *Deductive Logic,* and that which deals with Inductive Inference is called *Inductive Logic*

First we shall take up Deduction and explain its various parts. These deal with (1) *Ideas or concepts, (or Terms)*, (2) *Judgments, (or Propositions)*, *and* (3) *Inference* But before explaining these we have to know a little more about Logic by way of introduction.

3.   The Function of Logic as a Science Conceptualism, Nominalism, and Realism

Now after we have seen the meaning of the different terms that we have used in defining Logic there yet remains one question to be considered and answered.   We have just said that the subject of Deductive Logic falls into three parts, that is to say, it deals with concepts, judgments and inference.   We know that concepts are ideas of certain concrete or abstract things   These when expressed in language are called *terms*   In the same way, a judgment is an act of our mind whereby we affirm or deny a certain relation between two concepts, which, in their turn, must stand for two kinds of reality   A judgment expressed in language is called a proposition   An inference too is some kind of conclusion about the relation of concepts or judgments,—terms or propositions.   The question may be as to whether Logic deals only with one of the following or with all of them

     (1) Concepts or ideas apart from the reality for which they stand

     (2) The names which those concepts or those forms of reality bear

(3) The real things themselves.

The first view, held by certain logicians, is called *Conceptualism*, for it considers Logic as dealing with concepts only. The second view is called *Nominalism*, for, according to it, Logic deals with names or terms only. The third view is called *Realism*, for, according to it, Logic deals with real things,—abstract or concrete, or even imaginary.

When Logic is considered from these three points of view it is said to be defined from the (1) the Subjective, (2) the Linguistic, and (3) the Objective or Realistic, points of view.

A little consideration will show that no one view out of these three is correct to the exclusion of the other two. Logic does deal, in the first instance, with concepts or ideas in our minds But these evidently stand for some kind of *reality* which they represent—of which they are the concepts Then again a concept in order to be fixed up and handled in thought must necessarily be expressed by some *word or term* in language,—it must take some 'form' Thus the concept, the reality which it represents, and the name it bears all go together in thought. A concept without some reality corresponding to it will be no concept, and a reality without having a concept corresponding to it will be no reality to us Similarly we could hardly think of a concept or a thing unless it is named by some term. *So our conclusion will have to be that Logic as the science of thought must deal with all of them, and not with any one of them to the exclusion of the other two* As every con-

cept, or every name, is the concept or name of some real things, we might say that reality is the ultimate subject of every act of thought, i e, of every judgment, and so of Logic too; for Logic deals with judgments.

4   THE QUESTION OF FORMAL AND MATERIAL LOGIC

What has been said above with regard to the controversy of Conceptualism, Nominalism and Realism must also help us to decide whether it is correct to speak of Logic as formal or material   Those who think that Logic has only to do with the forms of thought and the rules of their mutual consistency,—i.e , with *formal consistency* only, consider it to be a formal science   According to them, Logic has nothing to do with the matter of thought and the rules of the consistency of truth, i e , with *objective consistency*   According to others, Logic is a science which deals not only with the forms but also with the matter of thought   This problem raises the question of the relation of form to matter. Is it possible that there might be form without matter, or matter without form? Evidently it is not   *Form and matter are correlative and interdependent, and so they go together   Therefore, no science can really be purely formal or purely material*   It has to be both   If Logic deals with thought, it must deal both with the form and the matter of it   A purely formal Logic which tries to limit itself to the consideration of mere forms without regard for matter must be useless,—nay worse, even an im-

datum. This is to be found in   (ɪ) the musings of our own minds, (ɪɪ) in the daily conversation or occasional discourses, and (ɪɪɪ) in the writings of authors, especially those on scientific subjects   It need not be said that it is chiefly the third kind of material which provides the most fruitful basis for logical investigations. For it is by an examination of scientific thought that the principles of correct thinking are best revealed.   Sciences are the best examples of a systematic and coherent thought.

QUESTIONS

1   State and criticise any three definitions of Logic with which you may be familiar   What definition do you yourself prefer and on what grounds?

2   "Logic is a science rather than an art "

What is the difference between a science and an art?

In what sense may Logic be called an art, and in what sense a science? (A. U, 1893)

3   Define Logic   Is Deductive Logic the   same   as   Logic? Name the three parts into which the science of Deductive Logic is generally divided   Illustrate your answer   (A U, 1895)

4   Why do some Logicians speak of *Terms* and *Propositions,* and other logicians of *Concepts* and *Judgments?*

5   Define Logic clearly bringing out its nature as a science How far is it correct to say that Logic is concerned with language? (A U, 1898).

6   (*a*) Distinguish between the form and matter of thought, and also between formal and real truth

(*b*) Is Deductive Logic a formal science?   Give reasons for your answer   (A U, 1904)

7   What do you understand by the terms Science, Law and Thought? (A U, 1914)

8   What definition of Logic seems to you to state most accurately the nature of that study?   Give one or two other definitions that have been suggested, and explain why you prefer your own?   (A U, 1916).

9   Give with explanations what you consider a satisfactory definition of Logic

What is the value of Logic?   What is meant by saying that Logic deals only with the form of thought?   (A U, 1920)

10   What do you understand by the assertion that Logic is an objective science?   If not objective, what is it in your opinion? (London Senior)

11   What is Logic?   Discuss whether language, thought, or objects are its subject-matter

12   How may the disputes as to the definition of Logic   be accounted for?   (O Mods).

13   Distinguish between Deduction and Induction.

14   What do you mean by science?   How does scientific knowledge differ from ordinary knowledge?   What claim has Logic to be considered as a science?   (A. U, 1923)

15   Logic has been described as a *regulative* science   Explain the significance of the epithet.

Discuss the question whether Logic is a science or an art (U I B, 1925)

16   'To study Logic is to think about thought in order to distinguish between correct or valid thought'.

Explain this definition fully, and give examples to illustrate your answer   (U I B, 1926)

17   Discuss the scope of Logic

Explain and examine the following statement —

'Logic is concerned with consistency and not with truth' (U I B, 1927)

18   Logic has been defined as the Science of Laws of Thought   Explain clearly what is meant here by the terms— Science, Thought, and Formal Laws   (U I B, 1928)

CHAPTER II
RELATION OF LOGIC TO OTHER SCIENCES

1. THE SCHEME OF SCIENCES

Since the dawn of human consciousness attempts have been made to know the world in its various aspects, and the results of a systematic investigation into its nature have been recorded in the form of what we have come to call scientific knowledge or sciences The science which discusses the nature of the world as a whole is called Ontology or the science of existence. Then sciences may be classified as *mental* and *material sciences* according as they deal with the mental or the material forms of existence. Under the material sciences fall such subjects as Physics, Chemistry, and Biology with its two branches of Botany and Zoology

Psychology is the science of mind, and deals with its three aspects of knowing, feeling and willing, in so far as they are mental process Then the science which deals with the standard or norm of knowing is Logic That which has for its subject the ideal of beauty is called Aesthetics

That science which has to do with the ideal of conduct (willing) is called Ethics The science which deals with the rules of correct expression of thought in language

is Grammar. The study of the problem how knowledge of the material world is possible at all is called Epistemology These sciences may be arranged in a tabular form as follows.—

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                    Ontology or Metaphysics
                    (the Science of Being)
                              |
        ┌─────────────────────┴────────────────────────┐
   Material Sciences                              Mental Sciences
(dealing with material existence)          (dealing with mental existence)
            |                                       Psychology
   ┌────┬───┴───┬──────┐                                |
 Biology Geology Physics Chemistry                    Logic
   |                                                    |
 ┌─┴────────────────────┐                           Aesthetics
Botany              Zoology                             |
                                                      Ethics
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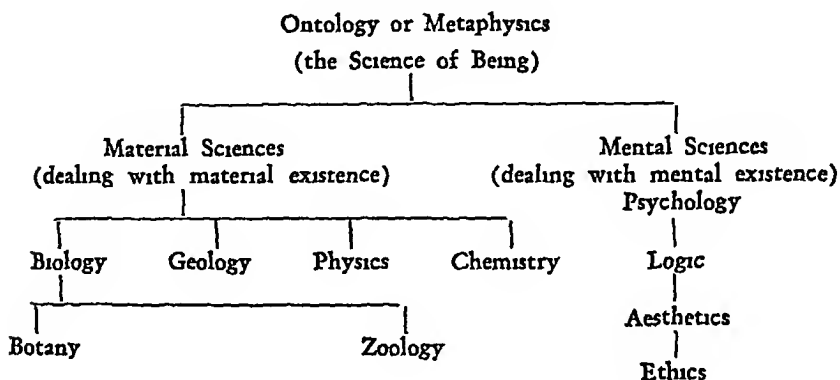
The above table is by no means complete The names of several sciences have been omitted in order to avoid unnecessary detail

It will appear that Logic is a mental science, for it deals with the standard or norm of one of the aspects of mind—viz , knowing

2 LOGIC AND PSYCHOLOGY

But we have seen that Psychology also deals with knowledge Then what is the difference between Logic and Psychology, and how are they related to each other? Both of them are mental sciences But, while Psychology deals with all the three aspects of mind knowing, feeling and willing, Logic deals with only one of them, viz , knowing Further, while Psychology deals with *the process of knowing* irrespective of whether knowledge is correct or not, Logic

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deals with the *norm or standard of knowing*, i.e., with correct thought only. Thus while Psychology may be called an empirical science in the sense that it classifies and explains facts of mental life, Logic is a normative or regulative science, in so far as it deals with the norm or standard of thought That is to say, it formulates laws to which every act of thought *must* conform in order to be valid.

3. Logic and Epistemology

According to the modern conception of Logic, that is to say as a science which deals with the nature and validity of knowledge, it is hardly different from Epistemology In practice, however, we find that while Logic usually goes into a detailed analysis and classification of the various forms of knowledge such as concepts, judgments and inference, Epistemology discusses the more general problems of the possibility and validity of knowledge·   How   is knowledge possible, and what are the critria of its validity?

4. Logic and Grammar

It has been said in the First Chapter that Logic deals with language to a certain extent   We know that Grammar also is a science of language.   Then how do the two sciences differ? The difference between the two lies in this· (1) that while Grammar treats of all kinds of words used in speech, Logic has to do only with such of them as can form part of a proposition as subject, predicate, or copula.   Thus we find that as a rule Logic considers only nouns, pronouns and adjectives, which form the subject and the predicate.

and the verb 'to be,' which forms the copula of a logical proposition With the rest of the parts of speech it has nothing to do, (2) that Logic considers only such sentences as can affirm or deny something, for only such sentences can form a logical proposition The other kinds of sentences recognised in Grammar, for example interrogative, optative and exclamatory, fall outside the scope of Logic, (3) while Grammar deals primarily with the correctness of language and only secondarily with thought, Logic deals primarily with the correctness of thought and only secondarily with language That is to say, while Grammar lays down the rules of correct speech, and has to do with thought only in so far as every form of language must have some sense, Logic, on the other hand, lays down the rules of correct thinking and has to do with language only in so far as every act of thought must be expressed in some form of speech

5 LOGIC AND OTHER SCIENCES

We have defined Logic as the science of the laws of correct thought or knowledge, and science as systematised knowledge We have also seen that all the various sciences that we know of are the embodiments of this systematic knowledge Now this scientific knowledge must necessarily conform to the laws of thought which Logic formulates and explains *It is in this sense that Logic has been called the science of sciences, that is to say, the science which deals with those most general principles of enquiry which every science must presuppose and follow in order to arrive at*

correct conclusions. The various sciences also offer the most valuable data for logical enquiry.

It must be clearly understood that while the various sciences deal with their own particular subject-matter, Logic deals only with the most general principles which every one of them must observe in the course of its investigations and reasonings. Logic has nothing to do with the particular subject of any of them.

QUESTIONS

1   (*a*) What is the connection between Logic and Psychology?

(*b*) Is Logic more or less general than the other sciences? Give reasons for your answer   (A U, 1905)

2   How do you distinguish Logic from Metaphysics?   Could it be validly construed as a branch of the latter?   If not, why not? Show the fundamental relation in which Logic stands both to Psychology and Metaphysics   (London B A Hons).

3   Discuss the relation of Logic to Psychology and Grammar

4   Why has Logic been called the science of sciences? Show how Logic is related to other sciences

5   Why, and in what manner, is Logic concerned with the use of language? Distinguish carefully between the logical proposition and the grammatical sentence, giving examples

CHAPTER III

THE HISTORY AND VALUE OF LOGIC

1   OUTLINES OF THE HISTORY OF LOGIC

The history of logical studies may be conveniently divided into three periods   (*i*) the Early Period,   (*ii*) the Mediaeval Period, and (*iii*) the Renaissance Period.

(*i*) *The Early Period* —Like every other Western Science it is to the Greeks that we owe the origin of Logic   It is believed that logical enquiries began with the disputations of Zeno—the Eleatic, towards the end of the Fifth Century, B C, when owing to frequent philosophical discussions there was awakened a conscious interest in the methods of reasoning   This interest grew further   during the age of the Sophists and Socrates, when Rhetoric and Logic came into existence as distinct studies   Socrates' chief contribution to Logic was the importance of definition, as a means of knowing the true nature of things   Plato's contribution consisted of an analysis of the methods of discussion and sientific procedure   It is first in Aristotle that we find a systematic exposition of Logic in all its parts   This statement, however, holds good only of what we may call Western Logic. Indian Logic had quite an independent origin and development, and there are reasons to believe that Aristotle, who

might be called the real founder of Western Logic, had, through the Greek invasion of India by Alexander, come to be acquainted with the schools of Indian Philosophy which existed at that time   The similarity between Aristotle's syllogism and the form of inferential argument, consisting of five and three premises, in Indian Logic, is particularly striking [1]   Before Aristotle Logic was hardly anything more than the art of arguing.   His small treatises on Logic collectively form his *Organon*.   It is this logical tradition founded by Aristotle that comes down to our own day with certain alterations.

(*11*) *The Mediaeval Period.*—During the period which has been called the Middle Ages of Europe, Aristotle's work on Logic was known on the Continent only through imperfect translations   'Bring your beliefs into harmony with traditional authority' was the motto of this age, and so there was hardly any new contribution to Logic during this period   Much labour was spent upon elaborating a system of Logic which was at once abstract and highly formal.   'The long history of philosophic thought from Aristotle to the beginning of the modern period furnishes no new conception of logic so complete and methodical as to require detailed treatment, but exhibits alterations in special doctrines, additions, and new points of view numerous enough to account for a certain radical change in the mode of regarding logic which is, for our present purpose, the only interesting

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[1] See Part IV, Chapter, vii

feature   This change may perhaps be expressed not inac-
curately as the tendency towards formalising logic'[2]

(*iii*) *The Renaissance Period* —With the revival of
scientific study the deficiency of formal Logic was soon per-
ceived and the need was felt of formulating some such
principles as might regulate the observation and explana-
tion of the facts of nature   The motto of the new age was
"Bring all your beliefs into harmony with the facts of nature"
Roger Bacon (1214—1294) was the first writer on these
principles of scientific method   Latter on, Francis Bacon,
the chancellor, wrote his *Novum Organum* (the new instru-
ment) as against Aristotle's *Organon* which he wrongly
supposed to be of the same nature as the formal Logic of
the Middle Ages   This new system of Logic came to be
called *Induction or Inductive Logic* as distinguished from
the older one of *Deduction or Deductive Logic.* It has
also been called Material Logic to distinguish it from the
formal traditional doctrine   Herschel, Whewell and John
Stuart Mill are the most important among those who wrote
on the new subject in modern times

2   The Value of Logical Study

The historical retrospect of the origin and growth of
Logic given in the foregoing paragraph, ought to tell us
what the study of Logic has been good for at the various
stages of its development, and what is supposed to be the
chief aim of the study at present.

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[2] Adamson, *A Short History of Logic*, III, § 23

We saw that in the beginning it was mainly for discussion or argument that the aid of Logic was sought. This was so chiefly with the Sophists.

Socrates employed definition, which forms an important part of Logic, for the discovery of truth, or at least, for the discovery of ignorance of the people about matters which they thought they knew well and correctly. He did so in the course of discussions that he held with people in the street and the market place. The difference between the use of Logic as made by the Sophists and that by Socrates lay in the fact that while the former employed it simply for the sake of argument, the latter regarded it as an instrument for the sifting of popular beliefs, so as to separate, as far as practicable, truth from falsehood.

With Aristotle, the real founder of Logic as a science, the study came to be regarded as a complete exposition of the various parts and methods of reasoning or thinking.

During the Middle Ages, the study degenerated into a type of Logic which restricted itself to the elaboration and discussion of mere abstract forms of reasoning, without any regard whatsoever for the matter of thought, and so, as such, it came to be looked upon as entirely useless—nay even worse—as a source of misguidance. It was probably this kind of Logic that Benjamin Jowett had in view when he is recorded to have said, although not with fairness, that Logic is neither a science nor an art, but a dodge But we must remember *firstly*, that even formal Logic is a good instrument of mental discipline serving as a preparation

for the study of higher and abstruser problems; and *secondly*, that Logic of the Middle Ages does not truly represent the original logical tradition that comes down from Aristotle, and so the charges levelled against that corrupted form of study hardly apply to the purer and original Aristotelian doctrine

The Period of Renaissance formulated a system of Logic the express aim of which is scientific observation and explanation. This is the Logic of Truth as distinguished from the older traditional Logic which was supposed to be the Logic of Formal Consistency, and has received much attention in modern times.

To sum up we might say that the value of Logic consists in —

Firstly, its providing a wholesome mental discipline, which, in itself, apart from any further advantage, is very valuable by way of preparation for higher and more difficult studies

Secondly, its giving us a scientific knowledge of the general principles and conditions of correct thought or knowledge, which could be used to help us in thinking correctly for ourselves, and finding out errors, if there be any, in our own thinking as well as in that of others

Thirdly, its introducing us to the study of certain important metaphysical problems with which it is intimately connected, and thus forming a good introduction to the study of Philosophy

Fourthly, its formulating principles of scientific inquiry

with regard to the observation and explanation of the facts of nature, this being the chief aim of Inductive Logic.

Here it may be added that the student must be quite clear about the fact that Logic as the science of thought does not at all claim to teach men *how to think*. It was this misunderstanding with regard to the aim of Logic that made John Locke remark that 'God has not been so sparing to men as to make them barely two-legged creatures, and left it to Aristotle to make them rational.'[1] It is quite true that man has got natural powers of thinking, and he may even think correctly without the aid of Logic. What Logic aims at is to study thought and formulate the laws of correct thinking. *'It is not the object of Logic,' as says Joseph 'to make men rational, but rather to teach them in what their being rational consists.'*[2]

QUESTIONS

1. It has been said that the study of Logic is useless, because men can and do reason correctly without the aid of Logic. Show how this is to be met, and illustrate your answer. (A. U, 1901)

2. What, in your opinion, is the educational value of the study of Deductive Logic? (A. U, 1902).

3. What, in your opinion, are the uses of the study of Logic? (A U., 1902).

4. What is the value of Logic? What is meant by saying that Logic deals only with the form of thought? (A. U., 1920).

5. What practical value may be attributed to Logic (1) in the detection of error, (2) in the discovery of truth.

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[1] *Essay B K. IV* xvii, § 4
[2] *An Introduction to Logic*, p 3

CHAPTER IV
THE LAWS OF THOUGHT

1   Definition and General Characteristics

As already explained the Laws of Thought are those general principles which are presupposed in, and govern every act of correct thought   They are also called the *Regulative Principles of Thought, the Axioms of Thought, or the Postulates of Knowledge*   As such they are   (*i*) *Universal,* that is to say, they are applicable to each and every   act   of correct thought without exception, (*ii*) *Uniform,*—in every instance of thought they are applicable in the same sense, and in the same way, (*iii*) *Necessary,* that is, they form an essential condition of knowledge, without which knowledge would be impossible, (*iv*) *Fundamental or axiomatic,* they are self-evident, that is, they do not depend upon any other laws or principles for proof.   They are taken for granted as self-evident truths   For this reason they have also been called Axioms of Thought, or Postulates of Knowledge

2   The Laws Explained

Since the time of Aristotle three Laws of Thought have been recognised in Deductive Logic   These are as follows —

(*i*) *The Law of Identity*   'A thing is identical with itself,' which means that in the course of thought or argu-

ment (*a*) a term has always the same meaning, e.g., the term 'man' must always mean a human being; (*b*) a proposition must also have a uniform meaning, e.g., 'Man is a rational being' must always have the same sense; (*c*) the object or attribute referred to by a term or a proposition must be supposed to remain the same, (at least for the sake of a certain line of thought or argument,) although really nothing is exactly identical for even two moments.

The traditional form of this law has been 'A is A,' which, as an expression of the form of a judgment, must certainly be objectionable. For no judgment with identically the same subject and predicate can make any sense. The predicate, if it is to give us any information at all, must always be different from the subject. Judgments like 'A tree is a tree,' 'Green is green,' are meaningless, unless the predicate in such instances may be identical with the subject in order to emphasise the fact that the object denoted by the subject cannot be anything else besides what it is, that is to say, it cannot possess any other character. This meaning will be seen more clearly in such judgments as 'Boys are boys' (after all). *However, as a rule, the form of a judgment is 'A is B', and not 'A is A,'* and it ought to be remembered that the form 'A is B' is in full accordance with the meaning of the Law of Identity. 'In truth, it is only amidst some diversity that we know identity at all.' 'A bare identity is no identity—it is practically a negation of existence.

(*n*) *The Law of Non-Contradiction*, also named by

some logicians as *the Law of Contradiction*   This was for-
mulated by Aristotle thus   'It is impossible that the same
predicate should both belong, and not belong, *to the same
thing, at the same time and in the same way.*'   'A is B' and
'A is not B' cannot be true together   The judgments 'Man
is mortal' and 'Man is not mortal' cannot be true at one
and the same time   This form of the principle applies
to the consistency of propositions   The law is also applicable
to the meaning of terms   And in this sense its form is
stated thus   'A cannot both be B and not be B' at one
and the same time '   A man cannot both be mortal and
not be mortal   Thus, the form of the law as applied to the
consistency of propositions and terms respectively is (*a*)
'A is B' and 'A is not B,' cannot be true together, and (*b*)
'A cannot both be B and not be B'.   Both the alternatives
cannot be true   If the one is true, the other must be false
And both of them may be false, unless the alternatives are
contradictory propositions or contradictory terms *

(*iii*) *The Law of Excluded Middle* —The form of this
law as applied to terms is 'A is either B or not B', and as ap-

*NOTE—Here the student must be introduced to the distinction of contrary
and contradictory opposition of terms and propositions   A contrary opposition of
terms or propositions is that whereby the terms and propositions so related have
opposite meaning, but do not exhaust between themselves all the possible
alternatives with regard to the subject of discourse, e g , 'white' and
'black' are contrary terms   'All men are wise' and 'No man is wise' are con-
trary propositions   If one of such terms or propositions is true, the other must
be false, but both of them may be false.

A contradictory opposition means that the terms or propositions so
opposed completely exclude each other and exhaust between themselves all the
possible alternatives with regard to a certain subject of discourse, e g , 'man' and
'not-man' are contradictory terms, and 'All men are wise' and 'Some men are not
wise' are contradictory propositions

plied to the consistency of propositions it says that of the two propositions 'A is B' and 'A is not B' one must be true. Both cannot be false. It is clear that this principle is applicable only to contradictory terms and propositions   In the case of contrary terms and propositions there may be a third alternative between the two, and both the given alternatives may be false.

3   SOME OTHER PRINCIPLES OF THOUGHT

(1) *The Principle of Sufficient Reason* —This was first formulated by *Leibniz*, and runs thus "Whatever exists or is true must have a sufficient reason why the thing or proposition should be as it is and not otherwise" This law implies two things (1) the reason why an event takes place, and (2) the reason why we make a statement   'The principle in brief expresses the necessary postulate that explanation is attainable   The Law of Causation is the aspect of the principle of Sufficient Reason which is most frequently appealed to   The acceptance of the principle necessitates that if we grant the reason we must accept the consequence which follows from it, and it is, thus, one of the foundations, of syllogistic, and, indeed of all other reasoning   It follows from this, moreover, that logical necessity is not absolute but hypothetical, a consequence appears, if—and   only   if—the   appropriate   conditions   are   secured' (Welton's Manual of Logic)

(11) *Aristotle's Dictum de omni et nullo*—which means that "whatever is affirmed or denied of a class distributively

may be affirmed or denied of everything belonging to that class"

(*iii*) *Hamilton's Postulate*—"Before dealing with a judgment or reasoning expressed in language, the import of its terms should be fully understood, in other words, Logic postulates to be allowed to state explicitly in language all that is implicitly contained in the thought"

The postulate means to assert that we can vary the mode of stating a judgment so long as the meaning remains unchanged, for it is the meaning, and not the form of language, which is important.

(*iv*) *The Mathematical Axioms*—(*a*) *Argumentum a fortiori*, namely, "that a thing which is greater than a second, which is greater than a third, is greater than the third."

(*b*) The axiom that "two things equal to the same thing are equal to each other," and other axioms of a similar nature

(*v*) *The Fundamental Axioms or Canons of Syllogism*, as given by different logicians

4 How the Laws of Thought Differ from Other Kinds of Laws

Besides the Laws of Thought there are also other kinds of laws, e g, *the Laws of Nature and the Laws of State*

The Laws of Nature differ from the Laws of Thought and the Laws of State in this that while the former are inviolable, the latter two are violable   We find that every thing in nature necessarily obeys what we call the Laws

of Nature, while people can, and do violate, in a number of instances, the Laws of Thought and the Laws of State.

Then the Laws of Thought differ from the laws of a state in this that while the former are universal and uniform for all thought irrespective of the nationality of the thinker, the latter are applicable only within a certain defined area, viz , that state of which they are the laws   The former are necessary because of the authority of reason, while the latter are binding because of the statutes of a constituted state-authority.   The former are internal, while the latter are external   The former, *a priori*, i.e , independent of experience, while the latter are a *posteriori*, that is to say, based upon experience.

Similarly we may differentiate between the Laws of Thought and the laws of morality, or the laws of religion, or any other kinds of laws.

5.   THE IMPORTANCE OF THE LAWS OF THOUGHT

The Law of Identity is the fundamental justification and basis of the affirmative judgment in Logic, for   no   affirmation would be of any value unless the terms used as subject and predicate retain the same meaning throughout a certain course of thinking   *The Law of Non-Contradiction* together with that of Identity forms the basis of immediate inference from affirmative propositions. *The Law of Excluded Middle* is necessary, together with the two others, to provide a basis for some forms of immediate and mediate inference.

QUESTIONS

1   What do you mean by the First Principles and Laws of Thought? Enunciate them and show how they are connected with the process of reasoning   (A U, 1896)

2   (a) What is a law of thought?

    (b) Does Logic make the laws of thought, or do they exist independently?

    (c) Is Logic concerned with all the laws of thought?   (A U, 1903)

3   What is a Law of Thought? Explain the meaning of the three fundamental Laws of Thought and show how they are applied in Deductive Logic   (A U, 1913)

4   Examine the applicability of the scholastic formula 'A is A' to any actual judgment   (A U, 1914).

5   How do the Laws of Thought differ from other kinds of law? Show how they are applied in Conception, Judgment and Inference   (A U, 1915)

6   What do you mean by a Law of Thought   Show how the Laws of Identity and the Law of Contradiction are involved in the mood Celarent   (A U, 1919)

7   What is the place of the 'Laws of Thought' in the Science of Logic? How far do they resemble other scientific laws?   (N U, 1930)

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PART II
TERMS

remembered, however, that this reality, or real things, need not be material. They may well be abstract qualities, ideals, or mere fictions of imagination: in short, any thing which may form the object of our thought.

2.   How Concepts are Formed

Here it should be helpful to know what a *concept is* and how it is formed. A concept may be defined as an idea, or notion in our mind, which we form of an object taking into account all the essential qualities which it might possess in common with other objects of the class to which it belongs. It is the result of observation, analysis, comparison, and generalization, and is expressed by means of a word, or combination of words, called a name or a term. Dr. Ray thus describes the process of forming a concept: "The process of forming concepts may be regarded as consisting of the following steps: (1) the *observation* of individuals; (2) the *analysis* of each of them into its constituent attributes; (3) the *comparison* of them with one another, in order to find out the attributes in which they all agree, and to separate these from those in which they differ; (4) the *mental unification*, if possible, of these common attributes, that is, the thinking of them together or the making of the aggregate of them a single object of thought; (5) the *expression or symbolization* of this aggregate, or single object of thought, by an audible, visible, or other sign, usually by a word or a combination of words called a name or term. For example, in forming the con-

cept 'metal,' (1) different individual metals, such as gold, silver, copper, mercury, platinum etc., must be observed and experimented upon, (2) the attributes of each of them must be found out by physical and chemical methods; (3) they must be compared with one another in order to find out the attributes in which they agree; (4) these attributes, when found out, must be thought of together; and (5) symbolized for reference afterwards as well as for communication to others, by a word, or some other sign The concepts 'man,' 'horse,' 'plant,' 'animal,' 'book,' 'table,' 'element,' 'flower,' etc , are formed in the same manner."[1]

3   DISTINCTION BETWEEN A TERM, A NAME AND A WORD

(1) *A Term and a Name —*The most popular definition of a name is that of Hobbes'. It runs thus *'A name is a word taken at pleasure to serve for a mark, which may raise in our minds a thought like to some thought we had before, and which, being disposed in speech and pronounced to others, may be to them a sign of what thought the speaker had, or had not before his mind.'* It may be remarked that this definition of a name is faulty at least in two respects. *Firstly,* a name may be composed of more than one word, e g , the Governor-General of India, and *secondly,* the scientific view with regard to the origin and growth of names is not that they are 'taken at pleasure to serve for a mark,' but that they are the product of a natural and gradual development of the powers of expression in the history of the

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[1] *A Text-Book of Deductive Logic,* p 26, Italics are ours

human race. Keeping these facts in view, we may then define *a name as a word, or a combination of words, which may convey to our own mind, or to that of others, the idea of some object or objects with which it has come to be associated during the course of the origin and growth of a certain language.* Now from this definition of a name it will appear that all terms are names, that is to say, names of either substances or attributes, but all names are not necessarily terms, for only such names as are the subject or the predicate of a proposition are called terms. Terms, as parts of a proposition, refer to the objects of our thought.

(*ii*) *A Term and a Word—Categorematic and Syncategorematic Words*—A word is any symbol, whether spoken or written, which means something and can form part of a grammatical sentence. It may belong to any of the parts of speech. A term, on the other hand, as already pointed out, is only that word, or a combination of words, which can stand as the subject or the predicate of a logical proposition, and is usually only a noun, a pronoun, or an adjective. The rest of the parts of speech do not appear in Logic as terms except in so far as they may stand merely as names of those words. For example, the prepositions 'from,' 'to,' 'with,' etc., the conjunctions 'and,' 'as well as,' etc., and similarly adverbs, and interjections, would not be terms except in such propositions as 'From' is a preposition, 'And' is a conjunction, and so on. Thus all terms are words, but all words are not terms. *The words which can be used by themselves as terms, that is to say, those which can stand*

as the subject or the predicate of a proposition, are called Categorematic Words, such as, man, horse, black, white, etc *While those words which cannot be used, by themselves, as terms in a proposition are called Syncategorematic Words,* such as 'in,' 'alas,' 'formerly,' 'and,' etc

4. THE DIVISION OF TERMS

Just as in Grammar we divide words into so many parts of speech according to their meaning, so in Logic, we divide terms into certain classes according to their significance in a proposition. Some of the divisions correspond to those we find in Grammar. The following is the usual table of the division of terms:—

I — { Concrete
       Abstract
       Attributive or Adjectival

II.— { Singular or Individual
        General
        Collective, or Distributive Terms

III.— { Positive
         Negative
         Privative

IV.— { Absolute
        Relative or Correlative

V — { Connotative
       Non-connotative

I. Concrete, Abstract, and Attributive or Adjectival Terms

A Concrete Term is the name of a substance, or a class of substances; such as man, table, army, etc.

An Abstract Term is the name of an attribute, or a collection of attributes, considered apart from the substance in which it is to be found; such as manhood, redness, virtue, etc.

An Attributive or Adjectival Term is that which means neither a concrete substance, nor an abstract quality, but signifies the presence of a quality in some substance, such as manly, red, round, beautiful, etc. Attributive or Adjectival terms have to be grouped into a separate class from Abstract Terms for, *verbally*, they have got a different significance. As objects of thought terms are only either concrete or abstract, but as verbal distinctions they are either concrete, abstract, or attributive. We shall have to say something more about the Attributive Terms later on.

II. Singular and General Terms. Collective and Distributive Terms

Singular Terms are those which can be applied, in the same sense, to only one thing. These are called *Individual Terms*. Such terms may be either (*a*) *Proper Names*, e g , Rama, Allahabad, St. John's College, etc., or (*b*) *Significant Individual Names or Designations*, which are formed by adding some word or words to a general name so as to restrict its application to some one particular object, e g ,

this boy, the house in which you live, the book in your hand, etc

General Terms are those which can be used for any of the things belonging to a certain class, e g , horse, book, etc The terms 'man,' 'horse,' 'book,' can be used to denote any man, any horse, or any book, out of an indefinite number of men, horses and books.

Collective and Distributive Terms *Collective Terms* are those which are applicable to a number of things considered together, e g , 'army,' 'library,' 'class,' etc A collective term may be either Singular or General If it denotes some particular group or class it is Singular, e g , The 24th Rajput Regiment, St John's College Library If it denotes a general group or class it is general, e g , 'regiment,' 'library,' etc Thus it is plain that collective terms do not form a class co-ordinate with Singular and General terms The true antithesis is between the Collective and the Distributive Terms When we use a term so as to apply it to a number of things taken together as one whole, it is said to be used collectively, and when it is applicable to a number of things taken as separate units within a group, it is said to be used distributively, e g , in the sentences 'The whole army was destroyed,' the whole community suffered loss,' the terms 'army' and 'community' are used in a collective sense, while in the sentence "The class dispersed," 'the army is scattered,' the terms 'class,' and 'army' are used in a distributive sense

There has been a little difference of opinion as to

whether the names of such substances as water, gold, oil, etc., should be referred to the class of General or Singular Terms.   Some think that they ought to be referred to the class of Collective Terms.   Now in so far as we mean by such terms the whole of one kind of substance, or a particular portion of it, we may class them as Singular Collective Terms,—Singular, because they are applicable only to that kind or to that portion; and Collective, because the mass of that substance in all cases is an aggregate of innumerable homogeneous parts, e.g , the water in the bucket, the oil in the bottle, or the gold in your ring, etc.   But if we use such terms to denote indifferently only some part or parts of such homogeneous whole, they have to be classed as General Collective Terms,—General, because the term may be applied to any portion or portions of that substance, and Collective, for even the smallest portion of such substance is a collection of innumerable parts   Such terms have been named *Substantial Terms*

III   Positive, Negative and Privative Terms

A *Positive Term* is that which affirms the presence of some attribute or attributes, e g , fair, red, wine, man, etc.

A *Negative Term* is that which denies the presence of some attribute or attributes signified by the corresponding positive term such as unfit, unsteady, unfair, etc.

A *Privative Term* is that which implies the absence of some attribute which should have been present under normal circumstances, e g , blind, deaf, lame, etc

Indefinite, Indeterminate, or Infinite Terms The negative terms which are formed by adding 'not' or 'non' to a term such as 'not-man, not-horse', etc , have been called Indefinite, Indeterminate, or Infinite Terms, for they have no definite meaning, whatsoever. They are never used in real thinking and are mere 'figments of Logic'.

There is a difference of opinion with regard to the interpretation of such Infinite Terms According to Mill and Jevons, an infinite term together with its contradictory positive term exhausts the whole universe, e g., 'man' and 'not man' exhaust between themselves every kind of reality —'not-man' meaning every other thing besides man— horses, tables, books, Logic, etc. According to others, such as Bain and De Morgan, the two terms do not exhaust the whole universe, but only *the Universe of Discourse,* that is to say, 'man' and 'not-man' do not exhaust the whole of, and every kind of reality, but only the class of 'animals ' 'Not-man' would thus include only horses, asses, sheep, etc., and not books, tables and other such things

The 'Universe of Discourse' means only that much of reality which falls within the scope of our thinking at a certain time For example, when we think of 'man' and 'not-man' the object of the distinction could only be to differentiate between man and other animals So the universe of discourse is the class of animals

Contradictory, Contrary and Repugnant Terms. Terms which are exclusive of each other are either contradictory, contrary or repugnant in their relation.

Two exclusive terms which exhaust between themselves one whole universe of discourse are called *Contradictory Terms*, such as 'man' and 'not-man'. These two terms exhaust the whole class of animals.

Those terms which, although they do not exhaust all the alternatives within a certain sphere of thought, still indicate the greatest possible divergence of meaning within that sphere are called *Contrary Terms*, such as 'black' and 'white.' These terms show the greatest possible opposition within the sphere of colours.

The terms which are neither contradictory nor contrary in relation to each other, but are still incompatible with reference to one and the same object of thought have been called *Repugnant Terms*, such as 'red' and 'green,' 'square' and 'round' are repugnant to each other in the sense that we cannot predicate 'red' and 'green,' or 'square' and 'round' of one and the same object of our thought.

IV.   ABSOLUTE AND RELATIVE OR CORRELATIVE TERMS

Absolute Terms are those which refer to some person, thing or attribute without implying the existence of another person, thing or attribute as necessarily related to them, e g., man, table, round, etc.

Relative or Correlative Terms are those, which, while they refer to a person, thing or attribute, also imply at the same time the presence of another person, thing or attribute as necessarily related to them, e g , husband, the highest storey, equal, etc., these implying respectively the

existence of a wife, the other stories of a building, and the existence of at least two things which are equal to each other.

V. CONNOTATIVE AND NON-CONNOTATIVE TERMS

In order to understand the distinction between Connotative and Non-Connotative Terms we must first know the meaning of the denotation and connotation of terms. *The denotation of a term* consists of the persons or things to which the term is applicable, e g , the denotation of the term 'man,' consists of all individual beings called men, of 'table,' of all individual things called tables *The connotation of a term* consists of an attribute or attributes implied by the term, e g , 'rationality,' 'purity,' etc. Thus strictly speaking *Connotative Terms* are those which besides having a denotation also have some connotation, that is to say, which, in addition to a reference to some person or thing also imply some attribute or attributes possessed by that person or thing, e g , 'man', which, while it refers to beings called men, also implies the attributes of rationality and animality possessed by them. *Non-connotative Terms*, properly speaking, ought to be those which do not have any connotation, that is to say, those which only refer to some person or thing and do not imply an attribute, such as any proper name which might refer to some person or individual without implying any attribute, e g , 'Tidda,' 'Bhinna,' etc.

Mill's Definition of a Non-Connotative Term.

However it may be noted here that Mill, who is mostly responsible for this distinction in terms, defines a Non-Con-

notative term as one which signifies a subject only or an attribute only, e g., squareness, indivisibility, etc.

Thus according to our definition the following kinds of terms are connotative:—

(1) *All concrete general terms* such as man, horse, book, etc.

(2) *All abstract general terms,* for "even abstract names," says Mill, "though the names only of attributes, may in some instances be just considered as connotative, for attributes themselves may have attributes ascribed to them, and a word which denotes attributes may connote an attribute of those attributes, e.g., virtue, beauty, quantity, quality, etc., while they denote the various kinds of virtue, quantity and quality also connote, at the same time, the attribute or attributes common to all of them."

(3) *Singular terms* 'which denote things and connote or imply attributes belonging to those things, or convey some information about them,' e.g., the sun, the First Mohommadan Emperor of India, the author of the Ramayana, etc.

(4) *Collective Terms* which, whether singular or general, while they refer to a certain group, also imply attributes belonging to that group, e g., army, library, the Fourth Gurkha-Regiment, the Allahabad University Library, etc.

The following kinds of terms are *Non-Connotative* —

(1) Singular names which only refer to some person

or thing and do not imply an attribute, e.g , Tidda, Kinna, Chirpa, etc.

(2) (According to Mill), all singular abstract terms, that is to say, those terms which signify definite individual attributes, such as squareness, milk-whiteness, visibleness, etc

5   HAVE PROPER NAMES ANY CONNOTATION?

According to Mill all proper names are Non-Connotative 'Proper names,' says Mill, 'are not connotative, they denote the individuals who are called by them, but they do not indicate or imply any attribute as belonging to those individuals ' This view of Mill with regard to the nature of proper names is opposed by Professor Jevons and others. 'The connotation of a name,' says Jevons, 'is confused with the etymological meaning   or   the   circumstances,   which caused it to be affixed to a thing   Surely, no one who uses the name England and knows what it denotes, can be ignorant of the peculiar qualities and circumstances of the country, and these form the connotation of the term ' Thus, according to Professor Jevons, all proper names are connotative, signifying directly persons or things, and implying the attributes or qualities which belong to, and distinguish, them from other persons or things

Now there have been among logicians supporters both of Mill and Jevons with regard to their   views   about   the nature of proper names   *A little careful thought would show that proper names do possess connotation, although*

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it differs from that of the other kinds of connotative terms. Every individual person or thing which is denoted by a proper name must necessarily possess some attributes or qualities, and these form the connotation of the term. But this connotation of proper names is not of the same kind as that of common names, and differs from it in the following ways:—

(1) While the connotation of common names is almost *fixed*, that of proper names is *changing* with a change in the nature of the person or the thing denoted by it, e.g., the connotation of 'man' is fixed in so far as it always implies the attributes of 'rationality' and 'animality' which are common to all men; while that of Rama Chandra, which may be the name of a newly born child, is changing as the child grows and its nature changes. *That is the reason why* common names are found in a dictionary while ordinary proper names are not.

(2) The connotation of common names being fixed, *it is the same for all minds, is objective* so to say, while that of proper names *is not necessarily the same for all minds*— is *subjective* to a great extent; e.g , the connotation of 'horse' must be *the same for all persons equally*, while that of a particular person—Govinda, Rama, or Sita Bai differs with different individuals who happen to know him or her according to the degree of their intimacy.

It may, however, be noted for the sake of accuracy that the connotation of common names is also to a certain extent subjective in the sense that it does differ with differ-

ent individuals according to the degree and kind of knowledge which each has of the object denoted by the term, e g , the connotation of 'plant' is not the same to an ordinary man in the street and to a botanist On the other hand, the connotation of a proper name is also not altogether subjective,—that is to say, it is objective too in the sense that however it might differ in degree and kind with different individuals, it is ultimately dependent upon the real character of the object or person that bears the name In fact, we find that the connotation of the names of well-known historical persons, places, or objects does become fixed and objective in the same way as that of common names, and for this reason such proper names also find a place in the dictionary For example, Cæsar, Napolean, Washington, Shakespear, Kalidas, etc , have acquired a fixed objective connotation Further, the connotation of a common name also is liable to change due to the results of any scientific investigations which may change or modify the ordinary accepted view with regard to the nature of the object denoted by the name

That proper names, leaving out a few exceptions, do generally have some degree of connotation must be evident from the fact that they generally convey some information or other irrespective of our knowledge of the objects or persons named by them, for instance, names such as Govinda and Uma generally imply that (a) the persons named belong to the male and the female sex respectively, and (b) they are probably Hindus by birth Other proper names usually

indicate whether they are names of persons, animals, places rivers, or mountains.

6.   FURTHER DISTINCTIONS IN TERMS

Besides those enumerated above, logicians have made a few more distinctions with regard to the divisions of terms. These are more of a merely verbal than logical nature.   They are as follows:—

> (i) *Single-world and many-worded Terms*, according as the term consists of one word or more than one word; e.g , 'man' is a single-worded term, while 'the man in the street' is a many-worded term.

> (ii) *Univocal, Equivocal, and Analogous Terms.*

Univocal Terms are those which have only one meaning, e.g., man, servant, table, etc.

Equivocal Terms are those which have more than one meaning, e.g , 'page' means either the leaf of a book, or an attendant.

Analogous Terms are those 'which have more than one meaning, but the meanings have a certain degree of *identity* or correspondence, e.g , we speak of the foot of a man an the foot of a mountain meaning different things, but i both cases that on which the object stands.'[1]

> (iii) *Mixed Terms* are those which contain Categore matic as well as Syncategorematic Words e.g , 'The man who was ill,' in which the word

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[1] Joseph, *An Introduction to Logic*, p 34

'man,' 'who' and 'ill' are Categorematic, and 'the' and 'was' are Syncategorematic.

7   IS THE DISTINCTION OF SINGULAR AND GENERAL APPLICABLE TO ABSTRACT TERMS?

There is a difference of opinion which regard to the applicability of the distinction of Singular and General to Abstract Terms   Some logicians think that an abstract term is singular in so far as it refers to only one quality, e.g., squareness, indivisibility, etc , and it is general in so far as it refers to a number of qualities, e g , 'colour' which is applicable to a number of colours such as blue, red, green, etc.

A little consideration will show that although we may admit that there is a difference between such terms as 'squareness' and 'colour,' yet it is not such as may justify the applicability to them of the distinction of Singular and General in the same sense as, for example, it is applicable to the terms 'Socrates' and 'man ' 'Socrates' is the name of an individual man, while 'squareness' is the name of a quality which might be *common* to many individual objects. However, in so far as 'squareness' and 'indivisibility' etc , are single attributes, the names denoting them may be called Singular, while in so far as 'colour' and 'virtue' are attributes which admit of further distinctions, the names denoting them may be called General

8   IS THE DISTINCTION OF CONCRETE AND ABSTRACT APPLICABLE TO ATTRIBUTIVE TERMS

According to Mill all Attributive Terms are concrete,

for they do not mean a quality considered apart, or abstracted from an object, but as always associated with it. Now if an Attributive Term is to be called 'concrete' because it qualifies a Concrete Term it may as well be called 'abstract' if it happens to qualify an Abstract Term, e.g., in 'Indians are brave,' 'brave' is a concrete term, while in 'vice is common,' 'common' is an abstract term. But correctly speaking the distinction of Concrete and Abstract does not really apply to Attributive or Adjectival Terms, for in using them we neither name an object nor an attribute considered in abstraction. If, however, the distinction is to be made at all, it would be more correct to class the Attributive Terms as Abstract rather than as Concrete, for they can refer only to an attribute, or attributes, which is either affirmed or denied of a subject.

HINTS AND EXAMPLES

1   HINTS

How to divide terms? Proceed in the following manner. Find out if the word can be used as a term by itself or not, that is to say, whether it is Categorematic or Syncategorematic If the former, then carefully consider the meaning and point out whether the term is —

     (*i*) Concrete or Abstract

     (*ii*) Singular or General.

     (*iii*) Positive, Negative, Indefinite (Infinite or Indeterminate), or Privative.

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[1] Similarly the distinction of Singular and General also does not properly apply to Attributive Terms for the same reasons as it does not apply to Abstract Terms

(*iv*) Absolute or Correlative

(*v*) Connotative or Non-Connotative

Besides the above divisions which are applicable to almost every term, a term might be —

(*i*) Attributive or Adjectival

(*ii*) Collective, or Distributive

(*iii*) Contradictory, Contrary, or Repugnant, if considered in relation to another term

(*iv*) Univocal, Equivocal, or Analogous [1]

2 EXAMPLES

Q   *Give the logical charcteristics of the following terms —*
Man, Socrates, virtue, triangularity, tasteless, lame, not-man, husband, Chunna, Army, not-white, black, blue, leaf, corn, humanity, the Emperor of India, that man

A   (*i*) *Man,*—concrete, general, positive, absolute, connotative

(*ii*) *Socrates,*—concrete, singular, positive, absolute, connotative, in so far as we take it to be the name of the well-known philosopher of Greece, or of any other man whom we know

(*iii*) *Virtue,*—abstract, general (because it admits of the distinction of several kinds of virtues), positive, absolute, (but correlative if it necessarily implies the existence of vice), connotative

(*iv*) *Triangularity,*—abstract, singular (because it does not admit of any further distinctions), positive, absolute, and non-connotative

(*v*) *Tasteless,*—abstract, attributive, negative, absolute, connotative

(*vi*) *Lame,*—abstract, attributive, privative, absolute, connotative

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[1] If a term is equivocal or analogous, both the meanings should be explained first, and then the term characterised according to both of them separately, as if it were two terms

(*vii*) *Not-man,*—concrete, general indefinite, absolute, connotative.

(*viii*) *Husband,*—concrete, general, positive, correlative, connotative

(*ix*) *Chunna,*—concrete, singular, positive, absolute, connotative, or non-connotative, acccording as the person is known or not.

(*x*) *Army,*—concrete, general, collective, positive, absolute, connotative

(*xi*) *Not-white,*—abstract, attributive, general, indefinite, (contradictory of 'white'), absolute, connotative.

(*xii*) *Black,*—abstract, attributive, general, positive, (contrary of 'white'), absolute, connotative

(*xiii*) *Blue,*—abstract, attributive, general, positive, (repugnant of 'red,' 'green', etc), absolute, connotative

(*xiv*) *Leaf,*—it means either   (*i*)   the page of a book, or (*ii*) the part of a plant

In both the senses, it is concrete, general, positive, absolute, connotative, equivocal

(*xv*) *Corn,*—it means either (*i*) grain, or (*ii*) a horny hard excresence on the toe or foot,—concrete, general, positive, absolute, connotative, equivocal

(*xvi*) *Humanity*—it may mean either (1) the quality of being human, or (2) human race, and is therefore an equivocal term

(1) abstract, singular, positive, absolute, non-connotative.

(2) concrete, collective, singular, positive, absolute, connotative.

(*xvii*) *The Emperor of India,*—concrete, general (in as much as the title is applicable to all the Emperors of India), positive, relative (in so far as the emperor implies the subjects), connotative

(xviii) *That man,*—concrete, singular (designation), posi-
tive, absolute, connotative

QUESTIONS AND EXERCISES

1   Into what classes would you divide terms?   Arrange the
following according to your classification of terms —

Multitude, diamond, this diamond, good, goodness, the teacher
and the taught, inorganic, Fowler's Logic, the fury of the ele-
ments   (A U, 1895)

2   Which of the following terms are (*a*) Collective, (*b*)
Abstract, (*c*) Privative —

Student, iron, unhappy, brother, empty, school, deaf, autho-
rity, heedless, wood, class   (A U, 1896)

3   Explain and illustrate the distinction between a Collective
and a General term, a Privative and a Negative term, a Connota-
tive and a Non-connotative term

Is the name "Lord Beaconsfield" connotative or non-conno-
tative? Give reasons for your answer   (A U, 1897).

4   Show by examples that the division of terms into General
and Singular does not coincide with the division into Abstract and
Concrete   Distinguish between General and   Collective   Terms
(A U, 1902)

5   (*a*) Are there any terms which have a denotation but no
connotation?   Give reasons for your answer

(*b*) Arrange as many of the following terms as you can
under four heads, showing which of them are (*a*) General, (*b*)
Abstract, (*c*) Privative, and (*d*) Non-connotative —

Empty, whiteness, milk-whiteness, lame, unpleasantness, colour,
body, cessation, these men, army, British subject, Hamilton,
crooked, silence   (A. U, 1903)

6   (*a*) What is a concept?

(*b*) How is a concept formed?

(*c*) What is the relation between a concept and a judg-
ment?   (A U, 1905)

7   Arrange the following terms under separate heads showing which of them are. (1) Abstract, (2) General, (3) Correlative·—

Man, husband, four, fourth, empty, white, girl, daughter, activity, the wisdom of Socrates, winter, superior   (A U., 1906).

8   Distinguish between —(a) term and concept
                          (b) Contrary and   Contradictory
                               terms.
                          (c) Proposition and judgment

What is meant by the denotation and the connotation of a term?   What terms have no connotation and why?   (A. U, 1907).

9.   What reasons are there for discussing names in Logic? Classify names, explaining the principles on which each classification is based   (A U , 1908)

(In this question the word 'name' is equivalent to 'term.' The student might criticise this use, and point out the difference between a name of a term, (See p 39).)

10   Describe the logical characters of the following terms.— Ten, King Alexander, the majority, manhood, merciless   (A. U., 1910)

11   Explain what is meant by the connotation and the denotation of a term   Have abstract terms any denotation?   Have proper names any connotation?   Give reasons for your answer   (A U., 1917)

12   Distinguish between the collective and distributive use of names   Consider whether the subject is used collectively or distributively in each of the following propositions —

(a) A few brave men could quash the rebellion
(b) Few men are brave
(c) An army should consist of brave men
(d) All our pageants could not restore to us our lost
        soldiers   (Logic Exercises—Bartlett)

13   Show that the answer to the question whether proper names have connotation depends on what meaning is assigned to connotation. (Bartlett)

14 What kind of terms would you use, and why, to express (1) Contradiction, (2) Contrariety, and (3) Repugnance? Give examples (Questions on Logic)

15 Describe the logical characteristic of the following terms —Equal, equation, equality, equalness, inequality, and equalisation (L, B A)

16 Classify the following —Chemist, Chemical, Black, paper, in, Liverpool, money, also, cheese, sublimity, and, annoyance, sincere, deaf, a-never-to-be-for-gotten, volition, darkness, non-combatant, foot, Buffalo Bill, the wild man of the West (Questions on Logic)

17 Give three examples of each of the following Connotative Abstract Names, Connotative Singular Names, General Abstract Names, Collective General Names, Relative Names, Equivocal Names, and give reasons for regarding them as such (Questions on Logic)

18 Discuss and criticise the distinction between (a) terms possessing connotation only, (b) those possessing denotation only, and (c) those possessing both connotation and denotation (A U, 1921)

19 What is a 'term' in Logic? Distinguish it from a 'name' and a 'word' Give a complete logical description of the following terms —

The square root of nine, President, blind, invisible, humanity (U I B, 1926)

20 What do you understand by the connotation of a term? Has every term a connotation? Fully discuss this question, noticing different views (U I B, 1928)

21 (a) Distinguish between denotation and connotation of terms

(b) Are there any terms which are non-connotative? (N U, 1931)

CHAPTER II
THE DENOTATION AND CONNOTATION OF TERMS

1. The Denotation and Connotation of Terms

Terms may be interpreted in various ways, and we have seen in the last chapter some of the distinctions in their meaning. Those distinctions include that of the denotation and connotation of terms. A term may be interpreted either in its denotation, or in its connotation, or in both. We shall presently explain what these terms mean. The denotation or extension of a term signifies those things to which it refers; e.g., the denotation of 'man' is all the beings called by that name. The connotation or intension of a term means that attribute, or attributes, which it directly implies, and which are possessed by the things which the term denotes, e.g., animality' and 'rationality' from the connotation of the term 'man.' There has been a difference of opinion with regard to the exact meaning of connotation. Some writers hold that the connotation of a name includes all the attributes common to the members of the class of which it is the name. Thus Mr. E. C. Benecke says: "Just as the word 'man' denotes every creature, or class of creatures, having the attributes of humanity, whether we know him or not,

so does the word properly connote *the whole* of the proper-ties common to the class whether we know them or not."[1] But this view of connotation makes it ᴧ matter not of knowledge but entirely of objective existence, while Logic is concerned with such existence only as is *known.* Now if to avoid this objection it be said that the connotation of a name should include all the known attributes common to a class, "it might be pointed out that some of these cannot be regarded as essential, for instance, an animal which chewed the cud would be regarded as a ruminant, even though it did not agree with all known ruminants in posses-sing cloven feet The name cannot therefore, be said, strictly speaking, to imply the possession of that attribute Again, some attributes are derivative from others Thus, that an equilateral triangle is equiangular is an attribute derivable from those primary ones which the name directly implies It is most convenient, however, not to regard such attributes as forming part of the connotation, as that would be to confuse primary with secondary implication."[2] It would be thus seen that the connotation of a term means *all the essential known attributes* common to a class or found in an individual

2   RELATION BETWEEN THE DENOTATION AND CONNOTATION OF TERMS

The most accepted view with regard to the relation of the denotation to the connotation of a term is that *they vary*

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[1] *Mind Vol* vi, p 532
[2] *Intermediate Logic,* pp 28, 29

in inverse ratio. That is to say, it is generally believed that if the denotation of a term is increased, the connotation is decreased and *vice versa.*

Now, apart from other considerations, which we shall explain presently, it might be said that this form of stating the relation between the denotation and the connotation of a term is not correct, for it does not refer to the relation of the two kinds of meaning with reference to one and the same term. It really refers to the relation between the denotation and the connotation of a certain term when they are considered with reference to those of another term of greater or less denotation or connotation. For example, when we say that the denotation increases and the connotation decreases as we pass from the term 'Englishmen' to 'Europeans,' and from 'Europeans' to 'men,' we cannot maintain that the increase in denotation or the decrease in connotation is with reference to the term 'man,' 'Englishmen' or 'Europeans.' So far as these terms are considered by themselves their denotation and connotation are either the same always, or if there is any increase or decrease in either of them, it is possible without the corresponding decrease or increase in the other. For example, the denotation of 'man' is always all human beings and the connotation, say, animality and rationality   Now if there is an increase in the denotation of 'man,' say, by the discovery of a new inhabited island, the people of which possess the same common attributes of human beings, there will be no corresponding decrease in the connotation of the term. Similarly, if the connotation of 'man' increases by the discovery of

some new attribute which is common to *all* human beings, there will be no corresponding decrease in the denotation of the term. What we really mean by saying that denotation and connotation vary in inverse ratio is that if we pass from one term denoting a sub-class to another denoting a greater sub-class or class within the same genus, the connotation of this term of greater denotation will be less than that of the one with less denotation, and *vice versa* This variation might be illustrated by circles. For example, let us represent the denotation of 'men' by the circle M and its connotation by $a+r$—animality and rationality, of 'Europeans' by E and $a+r+e$ (taking e to mean the quality of being Europeans, which the class possesses in addition to the qualities of animality and rationality possessed by the class of men), of the 'French'
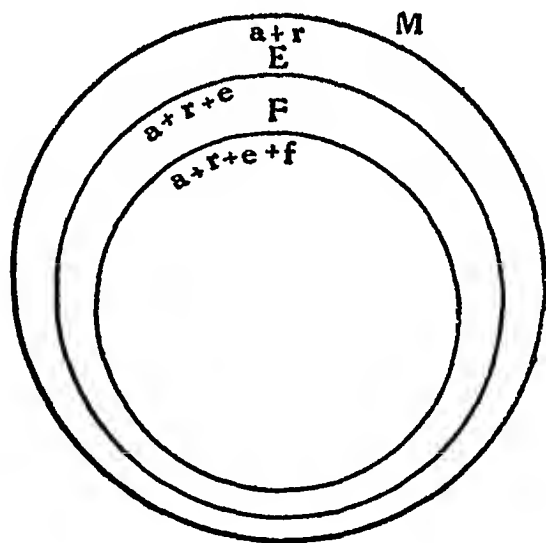
by F and $a+r+e+f$ (taking f to mean the quality of being French in addition to the qualities of $a+r+e$ possessed by the class of Europeans) Now we can see from the diagram, that

as we pass from 'men' to 'Europeans' and 'French' the circle of denotation grows smaller, that is to say, the class of Europeans is smaller than that of 'men' and that of the French smaller than that of Europeans, while the number of qualities which from the connotation of these terms becomes larger, that is to say, the number of qualities possessed by Europeans is larger than that possessed by men, and of those possessed by the French larger than that possessed by Europeans. In other words, as the denotation is decreased, the connotation is increased. On the other hand, if we start with the circle of the French we can see that as the connotation is decreased the denotation is increased.

3.   How far the Relation of Inverse Ratio is Correct

The relation of inverse ratio is correct only in the sense pointed out in the preceding paragraph, that is to say, only when we pass from a certain term of greater or less denotation or connotation to another of less or greater denotation or connotation. Otherwise this ratio breaks down in the following cases:—

(1)   When the denotation of a term is increased by the addition of things which possess no new attributes but only those which are already possessed by the class of those objects, the connotation remains unchanged, that is to say, it does not decrease, e.g., the discovery of the inhabitants of a new island, who also possess the same human attributes of animality and rationality in common with other men, will not lead to a decrease in the connotation of 'men'

(2)   When the denotation of a term is decreased by the deduction of a number of individual things in a class the connotation again remains unchanged, e g , the daily mortality of men does not lead to an increase in the attributes of human beings

(3)   When the connotation of a term is increased by an attribute, or attributes, which is found to be possessed by *all* the individual things denoted by it the increase in connotation does not lead to a decrease in denotation, e g , if it is found out that all plants have the power of sensibility, this discovery of a new attribute, although it leads to an increase in the connotation of 'plants,' does not bring about a decrease in its denotation

(4)   When the connotation of a term is decreased by the taking away of some attribute or attributes which could be denied of *all* individual things the denotation remains unchanged, e g , if animality be denied of all bats, the decrease in the connotation of 'bats' will not lead to any increase in its denotation

4   IS THE CONNOTATION OF A GENUS LESS THAN THAT OF THE SPECIES UNDER IT?

It must have been noticed in the previous paragraphs that it has been supposed throughout that the connotation of a sub-class, i e , of a species is greater than that of the other class which is greater than it, and is therefore a genus in relation to it, e g , the connotation of 'French' has been supposed to be greater than that of 'Europeans,' and again the conno-

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tation of 'Europeans' to be greater than that of 'men.' Now this doctrine that the connotation of a genus is less than that of the species under it has been rightly questioned by some logicians. A little thought will show that really the connotation of a genus is not at all less than that of the species, rather it is greater. A genus implies all the attributes which are possible to its species. What we call an additional attribute in the connotation of a species under a certain genus is the explication of one particular aspect of the genus. For example, the various attributes of being an European, an Asiatic, or an American, are already implied in the connotation of the genus man. They only become explicit in the connotation of the various species of Europeans, Asiatics and Americans. It is only because man is capable of living in a certain country that it is possible to have the distinctions of Europeans, Asiatics, or Americans. Thus we see that the connotation of a genus is not less than that of the species under it, although it may be admitted that the distinguishing attributes of the various species are only implicit in the connotation of their genus, and that they are to be seen explicitly in the connotation of the species.

QUESTIONS AND EXERCISES

1. (*a*) What is meant by the denotation and connotation of a term?

   (*b*) Explain and illustrate the rule that as the denotation of a term increases, its connotation decreases. (A. U., 1904).

2. Explain clearly what is meant by the extension and inten-

sion of terms, and discuss and criticise the following doctrines —

(*a*) Extension and Intension of terms vary inversely

(*b*) Proper names have no connotation or intension
(A U , 1911 and 1913)

3   Point out the ambiguity of the term connotation and the disputes arising therefrom 'A genus must have the qualities of *all* of its species' How does this effect the view that intension and extension stand in inverse relations?   (A U , 1914)

4   What do you understand by the connotation and the denotation of a term? How are these related? Illustrate   Has a proper name connotation?   Illustrate by reference to the following — Delhi, Abbotabad, Punjab, John, Johnson, Bottle-Walla   (A U , 1918)

5   Explain the distinction between the intension and extension of terms   What is the meaning of the statement that as the one increases, the other decreases, and what are the limits to the accuracy of the statement?   (A U , 1920)

6   "The more general a term becomes, the less it has of meaning" Explain, illustrate and criticise this statement   (A U , 1923)

7   Explain the difference of denotation and connotation with reference to the terms   Law, Legislator, Legality, Crime   (London, B A)

8   Arrange the following terms in order of extension   vertebrate, human, animal, substance, child, organism, school-boy (Questions on Logic)

9   Describe the change in the denotation and connotation of each of the terms in the following series as you pass from the first to the second, from the second to the third, and so forth, and again in the reverse order, as you pass from the last to the last but one, and so on

(*i*) Element, metal, gold

(*ii*) Literature, English Literature, Philosophical literature in English

(*iii*) Right-angled triangle, triangle, rectilineal figure, figure. (Ray's Logic).

10   Give three examples of a series of three, four or more terms each, in which each term of greater denotation stands before a term of less denotation

11.   Give some examples of terms the denotation of which may increase without any change in the connotation, and also of terms the connotation of which may increase without any change in the denotation.

12.   Comment upon the following: 'Genus is a part of species and species is a part of genus.'   (U I B., 1925).

13.   Define intension, connotation and denotation.   Can you say anything definitely about Smith, if I simply tell you that Smith is faithful?   Discuss the logical problem that arises in this connection.   (N. U., 1926).

14.   What do you understand by the connotation of a term? Has every term a connotation?   Fully discuss this question, noticing different views   (U I. B., 1928)

CHAPTER III

THE PREDICABLES

1. DEFINITION OF THE PREDICABLES

The predicables are the various relations in which the predicate can stand to the subject in a logical proposition. We have seen that every logical proposition contains a subject and a predicate   Now the predicate can stand in various relation to the subject   For example, in the proposition 'Men are rational animals' the denotation of the predicate exactly coincides with the denotation of the subject, while in the proposition 'Men are animals' the denotation of the predicate is greater than that of the subject   In the proposition 'Men are rational' the connotation of the predicate, viz., rationality, differentiates the class of men, which is denoted by the subject, from other classes of animals   Similarly   there   are other kinds of relations between the predicate and the subject of a proposition   The classification of these relations gives us the Heads of the Predicables   There have been two classifications of these   (i) by Aristotle, and (ii) by Porphyry

2   CLASSIFICATION OF THE PREDICABLES ACCORDING TO ARISTOTLE

The first classification of the predicables was   that   by Aristotle who classified the predicates   as   (i) those   which

agree in denotation with the subject, and (*ii*) those which differ in denotation from the subject.

(*i*) *Definition and Proprium.* Then the first kind of predicates he divided into:

> (*a*) those which agree in connotation with the subject.

> (*b*) those which differ in connotation from the subject.

The first of these he called *Definition*; e.g., the predicate in the proposition· 'A triangle is a three-sided rectilineal figure' is a definition. It agrees with the subject both in denotation and connotation.

The second of these he called *Proprium*; e g., in the proposition 'Man is social,' the predicate is a proprium. It agrees with the subject in denotation but differs from it in connotation.

(*ii*) *Genus and Accidens* The second kind of predicates, viz , those which differ in denotation from the subject, Aristotle divided into·

> (*a*) those which partially agree with the subject in their connotation.

> (*b*) those which wholly differ from the subject in their connotation

The first of these he called *Genus* For example, in the proposition 'Man is an animal' the predicate is a genus. It differs from the subject in denotation and only partially

agrees with it in connotation, for the connotation of 'man' is 'rationality' and 'animality'

The second of these he called *Accidens*. For example, in the proposition 'Some men are bearded' the predicate is an accidens   It differs from the subject both in denotation and connotation.

Thus according to Aristotle we get the following definitions of the predicables —

(1) *Definition*—the predicate which agrees with the subject both in denotation and connotation.

(2) *Property*—the predicate which agrees with the subject in denotation but differs from it in connotation

(3) *Genus*—the predicate which differs from the subject in denotation and partially agrees with it in connotation.

(4) *Accidens*—the predicate which differs from the subject both in denotation and connotation.

3   CLASSIFICATION OF THE PREDICABLES ACCORDING TO PORPHYRY

After Aristotle, Porphyry divided the predicables under five heads   (1) Genus, (2) Species, (3) Differentia,   (4) Proprium, and (5) Accidens   They may be defined as follows —

(1)   *Genus*—a wider class which contains a smaller class or classes, e g , 'man' is a genus in relation to 'Europeans.'

(2)   *Species*—a smaller class included in a larger class which is its genus, e g., 'triangle' is a species of 'figure'

(3) *Differentia*—an attribute, or a number of attributes, which differentiates one species from the other species under the same genus, e.g., 'rationality' is the differentia of 'men' and distinguishes them from other kinds of animals.

(4) *Proprium*—an attribute which does not form part of the connotation of a term but follows from it, for example, the attribute of being social is the proprium of 'man,' for it follows from his qualities of rationality and animality.

(5) *Accidens*—an attribute which neither forms part of the connotation of a term, nor does it follow necessarily from it, e g., the quality of one's complexion.

4. GENUS AND SPECIES

These are correlative terms. What is genus in relation to a smaller class, or classes, under it, may be species in relation to another class, which is greater than it.

Summum Genus. The highest class, that is one which is not a species in relation to any other class, is called the *Summum* or the *Highest Genus*, e.g., 'Being' may be called the *Summum Genus*.

Proximum Genus. In a series of genera and species, the genus which is the nearest in order to a certain species is called the *Proximum Genus* in relation to that species, e.g., 'man' is the *Proximum Genus* of 'Europeans.'

Subaltern Genus and Subaltern Species. In a series of genera and species every term in the line except the highest

genus and the lowest species is called a *Subaltern Genus* or a
Subaltern Species   In the following series —

<div align="center">

Being
|
Animals
|
Men
|
Europeans
|
Englishmen
|
Londoners

</div>
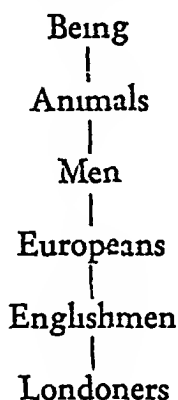
every term, except 'Being' and 'Londoners,' is either a
Subaltern Genus or a Subaltern Species

Cognate Genus and Cognate Species   Two or more genera
under which the same species fall are called *Cognate Genera*,
while two or more species falling under the same genus are
called *Cognate or Co-ordinate Species*, e g , in the following
division —
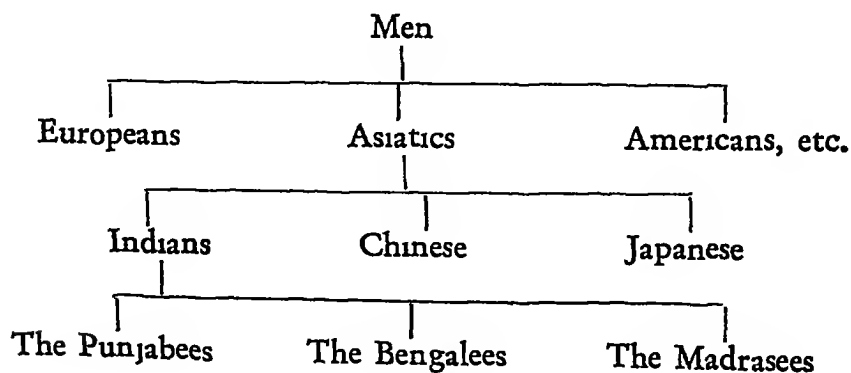
the three species under each of the genera 'Indian,' 'Asiatics' and 'Men' respectively are Cognate or Co-ordinate Species, while these genera themselves having the same species, viz., the Punjabees, the Bengalees and the Madrasees under them are Cognate Genera.

The Infima Species   In a series of classes the lowest one, under which there is no other class, is called the *Infima Species*, e g , in the above division, if under the class of the Punjabees we make a further sub-division of the Lahorese, i e , the inhabitants of Lahore, and then come down to the name of individual beings such as Rama Prasad, Rambhaja Dutta, etc., the class of the Lahorese is to be called the *Infima Species*.

5   DIFFERENTIA

A distinction has been drawn between *a Generic Differentia* and *a Specific Differentia*   *Generic Differentia* is that attribute which differentiates the genus of a species from a still higher genus.   *Specific Differentia* is that attribute which distinguishes a species from the other species under the same genus   For example, in the division of 'man' given above, the differentia of 'the Punjabees', viz , the quality of living in the Punjab, is a *Specific Differentia,* while that of 'Indian,' in relation to 'Asiatics,' and of 'Asiatics' in relation to 'men,' is a *Generic Differentia.*

6   PROPRIUM

A proprium has also been distinguished as *a Generic Proprium* and a *Specific Proprium*

A *Generic Proprium* is that attribute which follows from the connotation of the genus

A *Specific Proprium* is that which follows from the connotation of the species   For example, the attribute in Europeans that they cook food is a generic property, for it follows from the connotation of the genus 'men,' while the quality that they are of white complexion may be regarded as a specific property, for it follows from the connotation of Europeans that they live in Europe, which is a cold country and therefore produces people of white colour.

7.   ACCIDENS

An accidens has been distinguished as *Inseparable* and *Separable*

An Inseparable Accidens is that which belongs to all the members of a class, or to an individual,   at   all   times   and which can never be separated, e g , to be clovenfooted is an inseparable accident of ruminant animals, and one's place of birth is an inseparable accident of an individual

A *Separable Accidens* is that which does not belong to all the members of a class, or to an individual, at all times, e g , the black colour of certain crows, or the fact that some individuals are rich

An Inseparable Accident has to be very carefully distinguished from a proprium, for both of them are found in all the members of a class

8.   The Tree of Porphyry or the Ramean Tree

The above distinctions of the predicables are exemplified in what has been called the Tree of Porphyry after the name of Porphyry who first introduced that table.   It is also called the Ramean Tree, because Ramus, a writer on Logic in the 16th Century, gave prominence to it.   The students are advised to find out and name in it the following.—

(1)   The Summum Genus.

(2)   The Infima Species

(3)   The Sub-altern Genera.

(4)   The Sub-altern Species.

(5)   The Proximum Genus.

(6)   The Cognate Genera.

(7)   The Cognate or Co-ordinate Species, and also to point out the Generic and the Specific Differentia.

THE TREE OF PORPHYRY

Substance

Corporeal — Incorporeal

Body

Animate — Inanimate

Living Being

Sensible — Insensible

Animal

Rational — Irrational

Man

Socrates — Plato — and others
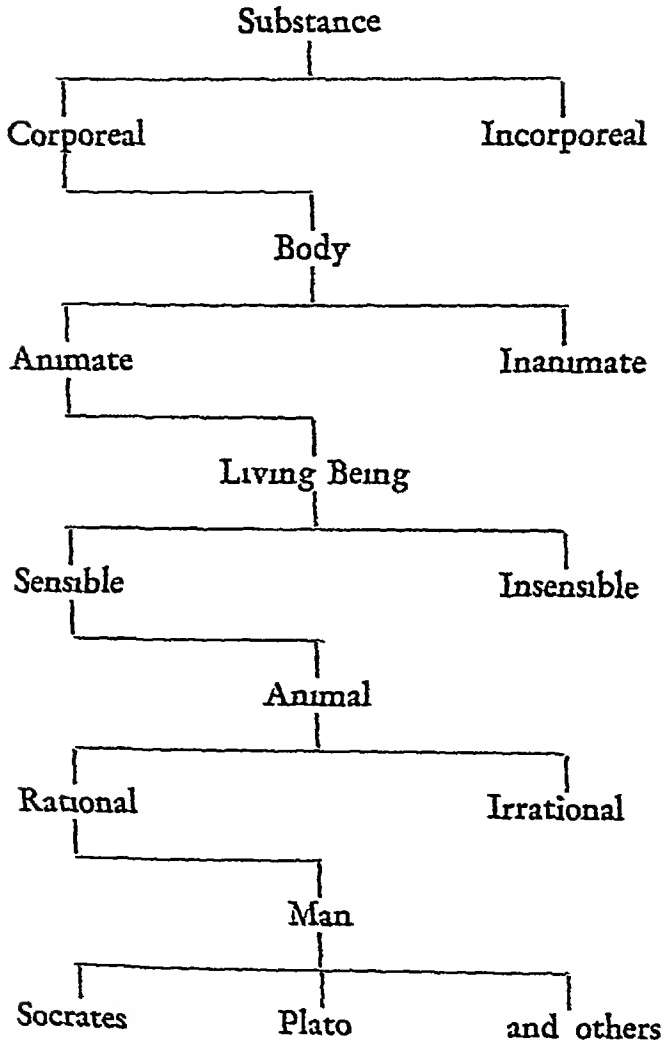
THE ARISTOTELIAN AND THE PORPHYRIAN LIST OF THE PREDICABLES

The obvious difference between the Aristotelian and the

Porphyrian list of the predicables is that the latter includes species, which the former does not. This indicates a change in the point of view in the list of Porphyry. The Aristotelian heads of predicables mean to classify *the relations of terms which are universal*, that is to say, those which are applicable to a number of individuals belonging to a class, while the Porphyrian list, by including species, '*indicates the relation in which the various universals predicated of an individual stand to their subject* for it is of individuals only that a species (such as man, or horse, or parrot-tulip) is predicated And various inconveniences arise from this change.'[1]

Firstly, it is difficult to determine what is a true species, and what only a genus within a wider genus.

Secondly, the Porphyrian list while it begins by distinguishing the relation of the predicates to an individual cannot continue true to this standpoint For we cannot distinguish between property and accident so long as the subject to which the predicates refer is an individual. "A property is necessary to its subject, and an accident is not, but all the attributes which belong to Catewayo are equally necessary to him as Catewayo; on what ground then are some to be called properties, and others accidents"?[1] It is really only with reference to a term denoting some class, that is to say, a universal term as subject that we can ask whether a given predicate is to be ranked as accident or property.

Thirdly, the Porphyrian doctrine gave rise to a division

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[1] Joseph, *An Introduction to Logic*, p 93

f accidents into separable and inseparable, which, if an in-
ividual be the subject, is confused, if an universal, self-con-
radictory   It is confused with reference to the individual,
or an attribute can be called an accident only in relation to
he species as subject, but inseparable with reference to the
ndividual   The division, therefore, involves two standpoints
it once.   It is self-contradictory with reference to a subject,
which is an universal, for relation to such a subject would not
be inseparable for that very reason, and if it is inseparable it
must be so because of the *nature* of the class to which the
term refers, and therefore not an accident.   It would be a
property

'It would be well therefore' says Joseph, 'to abandon the
division of accidents into separable and inseparable, and it
would be well to abandon the Porphyrian list of predicables
in favour of the Aristotelian '[1]

10   GENERAL REMARKS

A few more important points might be noted with re-
gard to the nature and use of the predicables.

Firstly, it will be noticed that in the list of the predicables
no provision has been made for singular terms used as predi-
cates   The reason is that the older logicians never regarded
singular terms as predicates

Secondly, when the predicate is a genus or a differentia
in relation to the subject, the proposition is said to be *analy-
tic, verbal, essential*, or *explicative*, for it simply states ex-

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[1] Ibid, p 96

plicity what is already contained in the subject implicitl
When the predicate is a proprium or accidens in relation
the subject the proposition is said to be *synthetic, real, acc
dental*, or *ampliative*. For example, 'A triangle is a three
sided figure' is an analytic proposition, while the propositio
'Man is a being who cooks food' is a synthetic proposition.

Thirdly, the predicables are very valuable for the pur
pose of classification, for it depends upon the determinatio
of genera and species, and upon finding out correctly wha
attributes are essential for the inclusion of any individual in
a given class.

HINTS AND EXAMPLES

Hints

(1) Unless stated otherwise, the student ought to refer terms
to the five-fold scheme of the predicables as given by Porphyry

(2) Whether a predicate is a genus, a species, a differentia, a
property, or an accident depends upon the meaning of the predicate-
term *in relation* to the subject-term and so the student is advised to
carefully consider this meaning before he assigns the term to a cer-
tain head of the predicables.

(3) Carefully distinguish between a property and an accident,
remembering that the former necessarily follows from the connota-
tion of the term, while the latter does not

(4) If both the subject and the predicate are singular terms,
probably synonymous, or if the predicate only is a singular term,
there is no predicable relation

(5) Briefly give your reasons for assigning a certain term to a
particular head of the predicables.

EXAMPLES

Q —Which predicable does each of the following statements illustrate?

(a) The Boers are British subjects

(b) Isosceles triangles have two of their angles equal each to the other

(c) Preaches are teachers

State reasons   (Bartlett)

A —(a) The predicate is a *genus* in relation to the subject, for it denotes a class which is greater than, and includes the class denoted by the subject

(b)   The predicate is a *property*, for it follows necessarily from the connotation of 'isosceles triangle' In other words, the equality of the angles follows necessarily from the equality of the sides

(c)   The predicate may be a *genus*, a *property*, or *an accident*, according as we regard the class of teachers as wider than and including the class of preachers, or take the attribute of teaching, in the wider sense, as necessarily following from the attribute of preaching, or consider the profession of teaching in the narrower sense of academic teachership as merely an accident in the case of some preachers

QUESTIONS AND EXERCISES

1   In the following propositions state whether the predicate stands related to the subject as genus, species, differentia, property or accident

(a) Gold is yellow

(b) Gold is found in Australia

(c) Man is capable of progress

(d) Oxygen is an elementary gas (A U , 1898)

2   Distinguish between a predicate and a predicable giving two or three illustrations   (A U , 1905)

6

3   Enumerate and define the predicables according to Aristot
and Porphyry

4   What do you understand by the Heads of Predicables·
Compare Aristotle's and Porphyry's classifications of predic
bles, explaining the different points of view from which the
arrived at their classifications Which classification do you cor
sider superior, and on what grounds?

5   Give the genus, the differentia, a proprium and an accider
of —Gold, Darwinian, rhombus, house, and say why you choo
what you give in your answer   (Questions on Logic)

6   Define and illustrate the following: Summum Genu
Proximum Genus, Subaltern Genus, Subaltern Species, Cognat
Genus, Cognate Species, Infima Species

7   Distinguish between and illustrate

(*a*) A generic and a specific differentia

(*b*) A generic and a specific proprium.

(*c*) A separable and an inseparable accident.

8   Give the Tree of Porphyry and explain its significance

9   Define predicables and show how they bring out the dis-
tinction between verbal and real propositions   (A U, 1907)

10   To which of the predicables would you refer the predi-
cates in the following and why?

(1)   All the angles of a square are equal

(2)   Lord Shaftesbury was a great philanthropist

(3)   All ducks are web-footed

(4)   Most Englishmen are brave

(5)   A triangle is three-sided

(6)   All republics are governments   (Questions on Logic)

11   Under what heads of predicables would you   class the
predicates of the following propositions, and why?

(*a*) Men are mortal

(*b*) This wood is teak

(*c*) A triangle has the interior angles equal to two right angles

(*d*) Shakespeare was a native of Stratford-on-Avon

(*e*) He has got his clothes on

(*f*) Courage is a moral quality   (A U, 1915)

12   Enumerate and define predicables   How are they connected with division and definition?   (U I B, 1925).

13   Define Genus, Differentia Proprium, and Accident   Illustrate them in case of (*i*) Logic, (*ii*) Book   (U I B, 1927)

14   Distinguish between Differentia, Property, and Accident   Give examples of each   Apply these distinctions to explain the difference between Analytical and Synthetical propositions   (U I B, 1928)

CHAPTER IV
THE CATEGORIES

1. DEFINITION OF THE CATEGORIES

According to Aristotle, the categories are the various kinds of (*a*) predicates, and (*b*) being or existence According to Kant they are the *a priori* forms of understanding, that is to say, the various relations in which the objects of experience are arranged by the mind. It is generally the Aristotelian list of the categories which finds acceptance in Logic.

The categories differ from the predicables in this that while the former are a classification of the kinds of *being* or *existence* which could be predicated of the subject, the latter are a classification of the various kinds of *relation* in which the predicate can stand to the subject

2. CLASSIFICATION OF THE CATEGORIES ACCORDING TO ARISTOTLE

We have said that by categories Aristotle meant to classify (*a*) the kinds of being, or (*b*) the kinds of predicates The Aristotelian list of the categories is as follows —

(1) Substance, e.g., Socrates, table, etc

(2) Quantity, e g , two pounds, three hundred rupees

(3) Quality, e g , blue, red, dead, alive, etc.

(4) Relation, e g , taller, smaller, lighter, etc

(5)   Place, e g., here, there, etc

(6)   Time, e g , one hour, two days, etc.

(7)   Situation, e g , horizontal, perpendicular, etc.

(8)   State, e g., poverty, fever, etc.

(9)   Activity, e g , to read, to walk, etc

(10)   Passivity, e g , to be beaten, to be carried, etc.

Thus a thing or a predicate falls under one or more of these heads The classification is, however, not complete, and is not based upon any distinct principle of division.

3 THE CATEGORIES ACCORDING TO KANT

According to Kant, the categories are the various relations which the mind sets up among the objects of experience They are the *a priori* forms of experience, that is to say, the conditions which make experience possible The Kantian list is derived from the terms of a logical judgment and stands as follows —

I —*Quantity*

(*i*) Unity, derived from a Singular Judgment, This S is P

(*ii*) Plurality, derived from a Particular Judgment, Some S is P

(*iii*) Totality, derived from a Universal Judgment, All S is P

II —*Quality*

(*i*) Reality, derived from an Affirmative Judgment, S is P

(*ii*) Negation, derived from a Negative Judgment, S *is* not P.

(*iii*) Limitation, derived from an Infinite Judgment, S *is* non-P.

III.—*Relation.*

(*i*) Substance and Attribute (Substantiality), derived from a Categorical Judgment, S *is* P.

(*ii*) Cause and Effect, (Causality), derived from a Hypothetical Judgment If A *is* B, C *is* D.

(*iii*) Reciprocity, derived from a Disjunctive Judgment, S *is* either P or Q.

IV.—*Modality.*

(*i*) Possibility and Impossibility, derived from a Problematic Judgment, S may be P

(*ii*) Existence and Non-existence, derived from an Assertory Judgment, S *is* P

(*iii*) Necessity and Contingency, derived from an Apodeictic or Necessary Judgment, S must be P

QUESTIONS

1   Explain fully what is meant by the categories   Give a list of them, and refer the following terms to their proper category: man, small, vice, here, to-morrow, fever, wading, red, upside down, heavier

2   What are the categories?   Distinguish them from the predicables

3   Give with examples the list of categories according to Aristotle, and show how they differ from the Kantian list

4   Give Kant's list of the categories and show how they are derived from logical Judgments

CHAPTER V
DEFINITION
1. WHAT IS DEFINITION?

As we know objects for ourselves, or communicate our knowledge to others, for the sake of accuracy, we try to make our notions about them as distinct and definite as possible. We perhaps begin with noting such attributes of a thing as are most obvious and gradually pass on to those which, although not very evident, are very essential. For there are generally two kinds of attributes which belong to every object of our knowledge (*i*) those which they possess in common with objects of other classes, and which, although quite obvious, are not essential to their existence, and (*ii*) those which are peculiar to their own class, that is to say, those which they possess in common with other objects of the same class and are essential to their existence For example, colour, size, etc, often belong to the first kind of qualities; while such attributes as rationality, three-sidedness, etc, belong to the second kind. Now the more we try to understand the *exact* nature of a thing for ourselves, or try to explain it to others, the more we take into consideration those qualities which are peculiar to the class and make it what it is. In other words, we try more and more to get at the *exact connotation* of the term

which stands as a name for the object of our knowledge. *Now when we determine and state the exact connotation of a term we are said to define it* In other words, *definition is a statement of the exact connotation of a term, and therefore, of the exact nature of the thing denoted by that term.* It is an explicit statement of the exact contents of the concept which we have ultimately formed of an object Thus a definition is *firstly,* an explicit statement of the contents of a concept, *secondly,* an exact statement of the meaning of a term, and *thirdly,* an exact determination of the nature of a thing Definition differs from description in this that while the former includes only the essential qualities which form the connotation of a term, the latter includes the essential as well as non-essential qualities, while a definition contains only the genus and differentia of a term, a description may also include the property and accident

How do we arrive at a definition? From what has been said above it must be clear that the process of arriving at a definition is really the process of getting at the exact concept of a thing, and therefore, as such, it involves all those processes of (*a*) observation, (*b*) analysis, (*c*) abstraction, (*d*) comparison and (*e*) generalisation which are necessary for forming a concept A correct definition has to conform to certain rules or conditions These are given in the next paragraph

2   THE RULES OF DEFINITION, AND THE FALLACIES
The Rules of Definition

(*1*) *It should be an exact statement of the connotation*

of the term defined. This is done by stating the genus and the differentia of the term. The genus given in the definition must be a proximate genus, that is, one which is immediately higher than the class denoted by the term. This rule is sometimes expressed by saying that a definition should be *per genus et differentiam.*

(*ii*) *It should exactly coincide in extent with the denotation of the term defined,* that is to say, it must not be applicable to any things outside the class denoted by the term defined, nor should it leave out any objects falling within that class.

(*iii*) *It should not include the term to be defined or any of its synonyms.*

(*iv*) *It should be expressed in a clear unambiguous language,* that is to say, it should be free from obscure and figurative expressions

(*v*) *It should not be negative where it can be affirmative*

The Fallacies

The First Rule For example, a correct definition of triangle according to this rule is that it is a three-sided rectilineal figure where 'rectilineal figure' is the genus, and 'three-sidedness', is the differentia

Now if a definition contains only a part of the connotation, it is *partial or incomplete*

When a definition contains any attribute or attributes not possessed by all the things denoted by the term, or not forming a part of the connotation, it is *accidental*

When some attributes which follow from the connotation of the term defined are stated in the definition, it is called *redundant*

When a statement of some of these qualities of the things denoted by the term is given indiscriminately it is *description*

"For example, 'a triangle is a figure which is bounded by three straight lines, and which has all its angles equal to two right angles' is a *redundant definition,* 'water is a liquid substance' is *incomplete,* 'man is a cooking animal,' and 'iron is the cheapest metal, are *accidental,* and a plant is an organism having roots, branches, leaves, flowers, fruits, etc , is a mere *description* "[1]

The Second Rule The violation of this rule leads to the faults of *too great width or narrowness*

If the definition is applicable to a class bigger than the one denoted by the term, it is *too wide;* and if it does not apply to all the members of the class denoted by the term, it is *too narrow* For example 'A triangle is a figure, or a three-sided figure' is too wide, and 'A man is an educated animal' is too narrow

The Third Rule The violation of the rule frustrates the purpose of definition, for if a definition contains the term to be defined or any of its synonyms, it does not take us any farther towards understanding or explaining the connotation of the term This way of defining terms leads to what is called a *circular definition* or 'a circle in defining'—

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[1] Ray's *Deductive Logic,* p 56

circulas in definiendo   For example, 'Man is a human being,' 'A triangle is a triangular figure,' etc., violate this rule.

An exception—Here it must be remembered that this rule is not violated when the name of the genus is repeated in defining a term which denotes a species subordinate to it, e g   'An isosceles triangle is a triangle which has two of its sides equal to each other.'   Here the repetition of 'triangle' in the definition does not break the rule.

The Fourth Rule.   The violation of this rule again goes against the aims and objects of a definition, for the use of terms with an obscure or ambiguous meaning does not help us to know the object of our thought   This kind of fault is known as *'Ignotum per Ignotius or per aeque ignotum"* —that is, explaining the unknown by the more or equally unknown   For example 'The mind is a *tabula rasa*,' 'Life is the process of metabolism and catabolism in the organism,' 'The world is a stage' may be taken as illustrations of this kind of faulty definition

The Fifth Rule   The violation of the rule sometimes gives rise to meaningless definition   We generally want to know what a thing *is* and not what it is not   For example, to define virtue as that which is the opposite of vice, good as that which is not bad, are meaningless   In some cases, it might be permissible to give a negative definition, where the term defined itself suggests a negative notion, e g , 'Non-Muslim voters are those who do not profess Mohammadanism,'   'Foreigners are those who do not belong to one's own country,'   'A blind man is one who cannot see '

3. CERTAIN DISTINCTIONS IN DEFINITION

Certain distinctions have been drawn in definition which are mostly verbal and have little logical significance   Some of them are the following —

(*i*) *Nominal and Real Definitions*   Nominal Definitions are said to be those which simply analyse the meaning of a term, while Real Definitions are those which define a real thing   It must be noted, however,   that   this   distinction is hardly justifiable, for a logical definition is both the analysis of the meaning of a term and the expression of the essential character of the thing denoted by that term

(*ii*) *Analytic   and   Synthetic   Definitions*   *Analytic Definitions* are those which aim at giving clearness and exactness to the commonly received meaning of a word

Synthetic Definitions are those which aim at giving a new and arbitrary meaning to an old term, or the equally arbitrary fixing of the connotation of a newly invented term to serve the purposes of some special discussion

'This   distinction   which   was   introduced   by Kant is psychological rather than logical, for it is based on the origin of the definition in its inventor's mind and not on the forms in which it is expressed '—(Welton)

(*iii*) *Substantial and Genetic or Constructive Definitions*

Substantial Definitions are those in which the essential attributes of a class are enumerated

Genetic or Constructive Definitions are those in which

the process by which the concept of a certain class may be formed is indicated.

(*iv*) *Essential Definition* is that which gives the connotation of a term, either completely or incompletely.

Perfect or Complete Definition is that in which the connotation of a term is given completely. This is the only true logical definition.

Imperfect or Incomplete Definition is that in which the connotation of a term is given incompletely This is not a logical definition.

When instead of giving the connotation of a term the *propria* are given, the statement is called a *Distinctive Explanation.*

4. LIMITS OF DEFINITION

Definition being necessarily an analysis of the connotation of a term obtained by finding out the genus and differentia, it follows that only such terms can be defined as admit of being referred to a genus and the connotation of which admits of analysis   The following kinds of terms cannot be defined —

(*a*) *Proper or Singular Names,* for they cannot be referred to a genus   Their connotation is not fixed, and therefore it cannot be analysed in the same way as that of common names

(*b*) Names of such simple attributes as hardly admit of an analysis, e g., red, pure, etc.

Further it may be observed. (*1*) that the correctness of

a definition depends a good deal upon the knowledge of the object denoted by the term, and scientific definitions are in most cases provisional, that is to say, they admit of correction or modification in the light of further researches that might be made with regard to the subject of the definition, (*ii*) that definitions of the same term might differ according to the difference of the point of view from which the object of definition is looked at

HINTS AND EXAMPLES

HINTS

1. *How to frame a logical definition?*

(*i*) *See if the term admits of definition* If it is a proper or singular name, or if it signifies some simple attribute, it cannot be defined

(*ii*) If the term admits of definition, *frame it by giving the genus and the differentia of the term* In case the correct genus and differentia are not known, they have to be given according to your best belief as to what they ought to be, and reasons for your choice are to be noted

(*iii*) The definition is to be framed by putting the term to be defined as the subject, and the genus and differentia as the predicate If the term has more than one meaning, it should be defined according to each of the meanings separately

(*iv*) See that none of the rules of definition is violated

2 *How to criticise a logical definition?*

(1) See if the term admits of definition, that is to say, if it is not a proper name or the name of a simple unanalysable attribute.

(2) If it admits of definition, test it by the rules of definition applying them one by one, and in case the definition is wrong, point out the fallacy by referring to the rule or rules which may

have been violated   Also construct, if possible, what you think would be a correct definition

EXAMPLES

1   Define the following terms   (*a*) Student, (*b*) College, (*c*) University.

(*a*) *Student.*—This term being a common name is definable, and so we try to find out the genus and the differentia   We have an idea of what a student is   We can easily see that the class of students belongs to that of human beings   So *the genus is* '*human beings*' *or* '*persons*'   Then the next question is with regard to the attribute which distinguishes this class of persons from other kinds of human beings   We know that students are invariably *engaged in pursuit of knowledge*   And so this quality might make the differentia   Putting the term to be defined as the subject, and the genus and the differentia as the predicate, we get the following definition of a student   '*A student is a person who is engaged in the pursuit of knowledge*'

On testing this by the rules of definition we find that none of them is violated, and so it   may   be   accepted   as   a   correct definition

(*b*) *College*—Following the same process as in (*a*) we find that the genus of college is '*an educational institution*', and the differentia '*one meant for advanced studies*', and so the definition is to be   '*A college is an educational institutation meant for advanced studies*'

(*c*) *University*—Genus   'A corporate educational institution'

Differentia—'Meant for the cultivation of general learning and culture'

Definition—'A university is a corporate educational institution meant for the cultivation of general learning and culture'

2   Critically examine the following attempts at definition.—

1   A Church is a place with a spire and stained glass windows

2   A politician is a man who is interested in Politics

3   An honest man is the noblest work of God

(Logic Exercises)

1   'Church'—It is a definable term   But the definition given here, when tested by the rules of definition, is found to be faulty, for it does not state the connotation of the term by giving the genus and differentia   To have a spire and stained glass windows is an accidens only and so the definition breaks the First Rule, that is to say, it is not *per genus et differentiam*   Then if we take the term 'place' as genus, it is not a *proximate genus* at all

The proximate genus would be 'a building' and the differentia 'meant for some kind of religious worship'   Thus the definition would be   '*A Church is a building meant for some kind of religious worship*'

2   *Politician*—It is a definable term   The genus 'man' is too narrow to include all politicians, for they may be women as well So we better substitute the term 'person' in its place   Then 'to be interested in politics' does not form the differentia of 'politician,' for persons who are not politicians may as well be interested in politics   Further, the word 'politics' used in the definition is almost a repetition of the term to be defined   Thus the definition violates Rules 1 and 3   The proper differentia of 'politician' would be 'one who is a systematic student of the methods of governing a state' The definition would therefore be   '*A politician is a person who is a systematic student of the methods of governing a state*'

3   'Honest man'—The definition neither gives the proximate genus nor the true differentia   The genus would be 'a person' and the differentia 'one who is true in thought, speech and action' Thus the definition is to be   '*An honest man is a person who is true in thought, speech and action*'

QUESTIONS AND EXERCISES

1   Give the rules of correct logical definition   Criticise the following definitions —

7

(*a*) Words are the signs of thought

(*b*) A gentleman is a man having no visible means of subsistence

(*c*) A gentleman is a man who wears English clothes.

(*d*) Opposed propositions are those which differ in quantity and quality.

(*e*) A judge is a lawyer who exercises judicial functions.

(*f*) Civilisation consists in eating with a knife and fork.
(A U., 1893).

2   What is the difference between a verbal explanation and a logical definition? What notions are capable and what incapable of logical definition?

Test the following examples by the Rules of Definition.

(*a*) Men define a man as the tool-wright, laughing creature

(*b*) Black is the opposite of white

(*c*) A triangle is a figure having three equal sides

(*d*) Life is a mode of activity

(*e*) Pleasure is the absence of pain

(*f*) Oxygen is a gas   (A. U., 1894)

3. Test the following by the Rules of Definition:—

(*a*) Wisdom defines and investigates truth

(*b*) Vivacious is the quality of being lively.

(*c*) Man is a warm-blooded animal

(*d*) A quadrilateral is a plane figure, having four equal sides and angles

(*e*) The soul is the first form of an organised body which has potential life

(*f*) Sweet is that which is not bitter

(*g*) Man is a rational creature who thinks, wills and acts

(*h*) Logic is the science of human knowledge   (A. U, 1894).

4   Test the following by the Rules of Logical Definition, pointing out, which (if any) are violated, and correct —

   (*a*) By the opposition of propositions is meant their differing in quality or quantity

   (*b*) A fallacy is an unsound mode of argument

   (*c*) A disjunctive syllogism is a syllogism whose major premise is a disjunctive proposition

   (*d*) Conversion is the changing of term in a proposition (A U, 1896).

5   Test the following as definitions.—

   (*a*) A soldier is a man brave and ready to die for his country

   (*b*) Life is the opposite of death

   (*c*) Virtue is acting rightly   (A U, 1899)

   (*d*) Man is a house-building animal

   (*e*) A university is a body of men engaged in the pursuit of learning   (A U, 1900)

6   Define any three of the following —history, cricket, geometry, Hindu   (A U, 1902)

7   (*a*) What is a definition?

   (*b*) Are there any terms which cannot be defined?   If so, why?

   (*c*) Can the correctness of a definition be sufficiently tested by formal Logic?   Give reasons for your answer

8   Examine the following definitions —

   (*a*) Logic is the science of thought

   (*b*) Man is a featherless biped

   (*c*) A plant is a being possessing vegetable life

   (*d*) Gold is a precious metal

9   What errors must we avoid in giving definitions?

Define the term 'undergraduate' and show how your answer fulfils the conditions of a good definition.   (A. U., 1910).

10   Criticise the following definitions —

(a) Knowledge is power.

(b) A washerman is a person who does washing.

(c) Life is the continuous adjustment of inner to outer relations.   (A U, 1915)

11   What is meant by Definition *per genus et differentiam*? Why is it that some terms can be defined and others cannot?

Discuss the definability of the following dog, comet, Asoka's Pillar, will, marriage

12   Give a logical definition of the following·—planet, microscope, malaria, contrapositive, liar, dichotomy   (A U, 1920).

13   Distinguish between Definition and Description, and criticise the following definitions

(a) Life is bottled sunshine

(b) Matter is that which can be perceived by the senses

(c) Logic is the medicine of the mind   (N U, 1925)

14   Why is it that some terms can be defined and other cannot? Indicate the significance of definition in Deductive Logic. (U I B, 1930).

15   What is meant by definition? Test the following definitions —

(a) Life is the sum of vital functions

(b) Mind is that which thinks, feels and wills

(c) An isosceles triangle which has two of its sides equal

If you consider them defective, suggest alternative definitions. (N U, 1927)

16   What is meant by the 'connotation' of a term? Illustrate your answer and show how it bears on the problem of giving a good definition. (N U, ·····)

17 (*a*) Distinguish between Description and Definition.

(*b*) What are the conditions of a good definition?

(*c*) Test the following definitions —

(*i*) A poet is an apostle of sweetness and light

(*ii*) Eccentricity is peculiar idiosyncracy

(*iii*) Peace is the absence of war   (N U, 1931).

CHAPTER VI
LOGICAL DIVISION
1. THE NATURE OF LOGICAL DIVISION

Just as definition is an analysis of the connotation of a term, *logical division is an analysis of the denotation or extension of a term*. It is the process of dividing a class into sub-classes on the basis of a certain principle which is the *fundamentum divisionis*, or the basis of division. Thus a class may be divided, on the basis of several principles, into different sub-classes. *The process of dividing the same genus into different sub-classes upon the basis of different principles has been called Co-Division*

2. LOGICAL DIVISION DISTINGUISHED FROM THE PHYSICAL AND THE METAPHYSICAL DIVISIONS AND VERBAL DISTINCTIONS

Besides logical division there are other kinds of division from which it ought to be carefully distinguished

Physical Division. This is a division of things into their various component parts, e g., of a table into the legs, the drawers, the top, etc.

Metaphysical Division is the analysis of an object into its various attributes—e g , of gold into its qualities of heaviness, yellowness, etc.

Verbal Distinctions are the various meanings which are possible to an equivocal term, e g , 'page' means the leaf of a book and an attendant

The above definitions must show that logical division differs from the physical and the metaphysical divisions in this that (1) while these latter are applicable to an individual object as well as to a class, the former applies only to a class, (2) in the latter the name of the term is not predicable of the parts or attributes obtained by division, while in the former the name of the genus is applicable to each subclass   For example, we cannot say that the legs, or the drawers of a table, are a table, or that hardness and yellowness are gold   But in the case of a logical division, e g , of men into the civilised and the uncivilised, we can quite correctly speak of civilised *men* and uncivilised *men*

3   THE RULES OF LOGICAL DIVISION, AND THE FALLACIES

The Rules

The rules necessarily follow from what has been said above with regard to the nature of logical division   These are as follows —

(1)   *What is to be divided should be a class and not an individual*

(2)   *Every act of division must be based upon one principle or fundamentum divisionis*

(3)   *The division must be exhaustive or complete*, that is to say, the various sub-classes into which a certain genus is divided must together be equal to the class divided

(4) *The division must be exclusive*, that is to say, the various sub-classes must exclude each other, i e., they should not overlap.

(5) The division, if it consists of more than one step, *must be a transition from an approximate genus to an approximate species. This is expressed by the old logical rule·'Divisio non faciat saltum'—Division must not make a leap*

(6) *The name of the whole must be predicable of each of the sub-classes*

The Fallacies.

First Rule—The violation of this rule means that the division is not logical at all. It must be a physical or a metaphysical division. For example, the division of the Taj into the gateway, the tomb and the dome, etc.

Second Rule—The violation of this rule means that individuals in one sub-class might also be included in another sub-class so that a certain part of the denotation is included more than once, or a certain sub-class may be excluded altogether. For example, the division of 'triangle' as follows.—

Triangle

Isosceles   Equilateral   Right-angled   Acute-angled
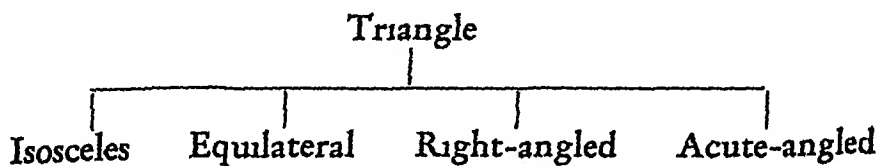
Here the same kind of triangles may be included under 'Isosceles' and 'Right-angled,' and also under 'Equilateral' and 'Acute-angled', while Obtuse-angled isosceles and Acute-angled isosceles triangles have been left out altogether.

Third Rule—The violation of the rule leads to what may be called an *Incomplete Division* The division includes only a part of the denotation of the term

For example—

Indians
into

The Hindus	The Mohammadans	The Parsees
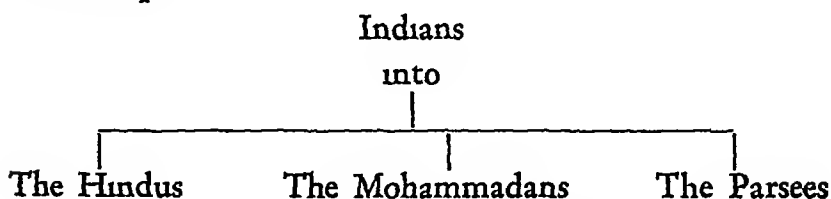
Here the Christians and people of several other religions have been left out

Fourth Rule—The violation of this rule gives rise to the fault of *Over-lapping or Cross-division* The violation of Rule 2 invariably leads to this fallacy For example, the division of triangle into equilateral, equiangular, isosceles and right-angled

Fifth Rule—The violation of this rule may lead to a too *Narrow Division*, that is, to the exclusion of a part of the denotation of the whole by the omission of a sub-class

For example—

Men
into

Europeans	Asiatics	Natives

Londoners	Parisians
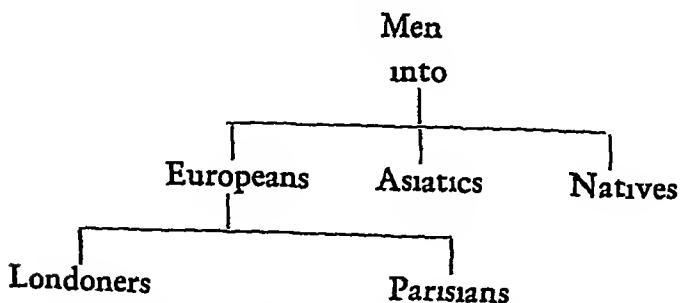
Here by omitting the sub-classes of Englishmen and

the French under the genus 'Europeans' we leave out the denotation of all Englishmen who are not Londoners and all the French who are not Parisians.

Sixth Rule—This rule is violated when the division is either metaphysical or physical, or a sub-class is included which does not properly form a part of the denotation of the term.

For example, in the physical division of

<p style="text-align:center;">Body
into</p>

The head	The trunk	The legs
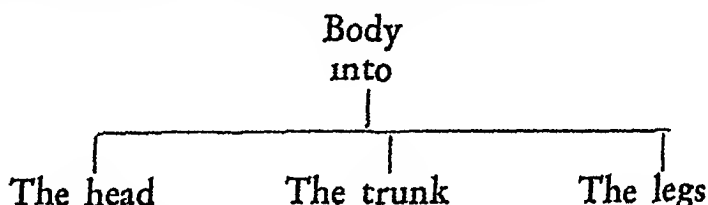
the name of the whole i e., the body, cannot be predicated of the parts—the head, the trunk and the legs, etc

4. DIVISION AND DEFINITION

It has been said that while definition is the analysis of the *connotation* of a term, division is the analysis of the *denotation* of the term which is divided "Division, in fact, adds clearness to our notions as definition makes them distinct. As compared with definition, however, logical division must be regarded as a secondary and indirect process, for it is a necessary assumption of formal logic that the connotation of a class-term determines its denotation and not *vice versa*

Besides division must presuppose more or less complete definitions of the names of species into which a given genus is to be divided, for it is only by appeal to such definitions that we can determine a *fundamentum divisionis*,

whilst every definition of a species-term *per genus et differen-tiam* suggests such a *fundamentum* "[1] *Thus we see that the process of division depends upon definition.* Definition and division find a place in Logic for they make our notions distinct and clear by an analysis of the connotation and the denotation of terms respectively

5 DIVISION AND CLASSIFICATION

Division and classification are closely allied to each other The difference between the two may be briefly summed up as follows —

(1) 'When we classify we start with the particulars of a genus, and throw them into groups, according to their resemblances and differences, when we divide, we start with the genus, and distinguish the species within it by the differentia of which the genus is susceptible '

(2) While classification moves upwards from the more special to the more general, division moves downwards from the more general to the more special.

"This, at least, is the difference which one would intend to indicate if one contrasted the two operations; but in actual practice our thought may move in both directions at once, and the process of dividing a genus is at the same time one of classifying the things in the genus If, for example, one were asked to divide the genus *novel*, he might suggest a division into the novel of adventure, of character, and of plot, but he would at the same time run over in

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[1] Welton's *Manual of Logic*

thought the novels that he had read, and ask himself if they could be classed satisfactorily under these three heads."[1]

6. DIVISION BY DICHOTOMY

Division by Dichotomy is a division into two at each step, so as to make the two sub-classes cover the whole. This is done by making one sub-class an indefinite term. For example, one of the divisions of 'man' according to the principle of Dichotomy may be as follows.—

```
                        Men
           ┌─────────────┴─────────────┐
      Europeans                    Non-Europeans
     ┌────┴────┐
  Greeks    Non-Greeks
    ┌─────────┴─────────┐
 Athenians        Non-Athenians
```
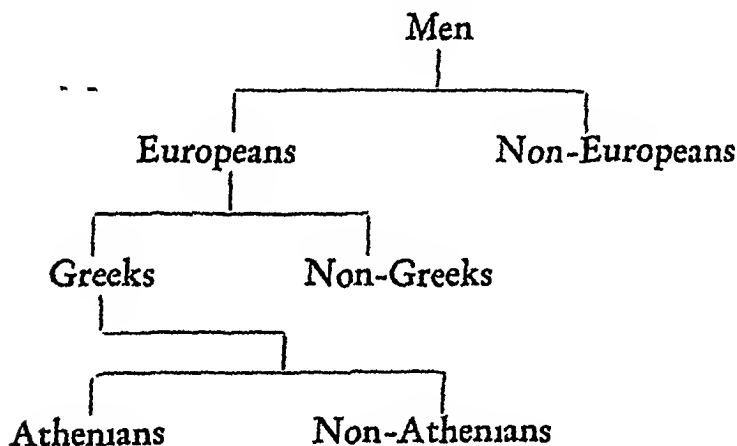
Porphyry's Tree given already is, omitting the last step, a good example of Division by Dichotomy

The value of Division by Dichotomy consists in:—

(*a*) Testing the correctness of our analysis, particularly in order to find out if it is exhaustive.

(*b*) Finding out the position of any given class or sub-class in the scale of genera and species

Division by Dichotomy is a purely formal process and does not violate any of the rules of logical division, but it is open to the following objections.—

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[1] Joseph, *An Introduction to Logic*, pp 101-102

(1) *One of the sub-classes in the division*, viz , that denoted by the indefinite term, and which is probably the larger one, *always remains undefined*

(2) So far as it is purely formal, *it is entirely hypothetical*, that is to say, it does not at all guarantee the real existence of any of the sub-classes

(3) *It is exceedingly cumbrous*, that is to say, by following this method we have to take too many steps in order to get at the *infima* species

HINTS AND EXAMPLES

HINTS

(1)   *How to make a division?*

(a) See whether the term admits of a logical division, that is to say, whether it is the name of a class or not

(b) If the term admits of a logical division, adopt some principle or basis of division and then divide the term according to the rules of division

(c) Remember that the process of dividing can be carried down only up to the lowest class—the *infima species*, and no further The *infima species* should not be sub-divided into individuals

2   *How to test a division?*

(a) First of all see whether the division is a logical division or not   It might be a metaphysical, or a physical division, or mere enumeration

(b) If the division is logical, see whether it is based upon one principle or not

(c) Test the division by applying the various rules, and point out the fallacy, if there is any

EXAMPLES

1   Divide logically (1) book, (2) house

A —(1) *Book*, this being the name of a class of objects can be divided logically. So let us adopt for division the basis of language in which they might be written The division is as follows —

```
                          Books
                            |
   ┌───────┬────────┬───────┴──────┬──────────────┐
English   French   German       Sanskrit    and of other
   |                  |                       languages
Scientific      Non-Scientific
                Scientific Books
                     |
          ┌──────────┴───────────┐
     Biology books          Non-Biology-books
          |
   ┌──────┴───────┐
Botany books   Zoology books
```
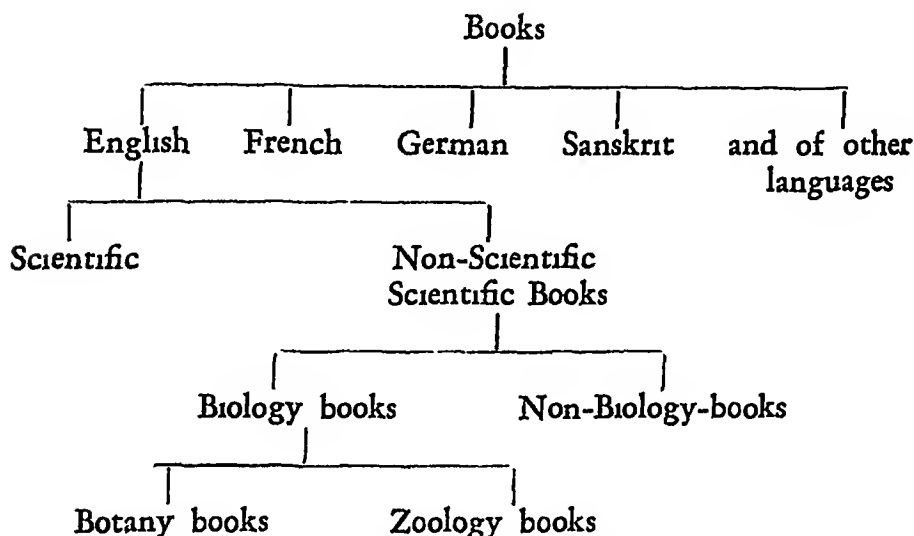
(2) *House*—a divisible term and can be divided on the basis of the material of which it might be made as follows —

```
                       House
                         |
   ┌────────────┬────────┴───────┬────────────────┐
Brick-houses  Wood-houses    Stone-houses    Those built of
                  |                            other materials
   ┌──────────────┴───────┐
Government Buildings   Private Buildings
         |
   ┌─────┴────────┐
Educational   Non-Educational
   |
┌──┴──────────┬────────────────────┐
School-building  College-building  Other kinds of educational
                                        buildings
```
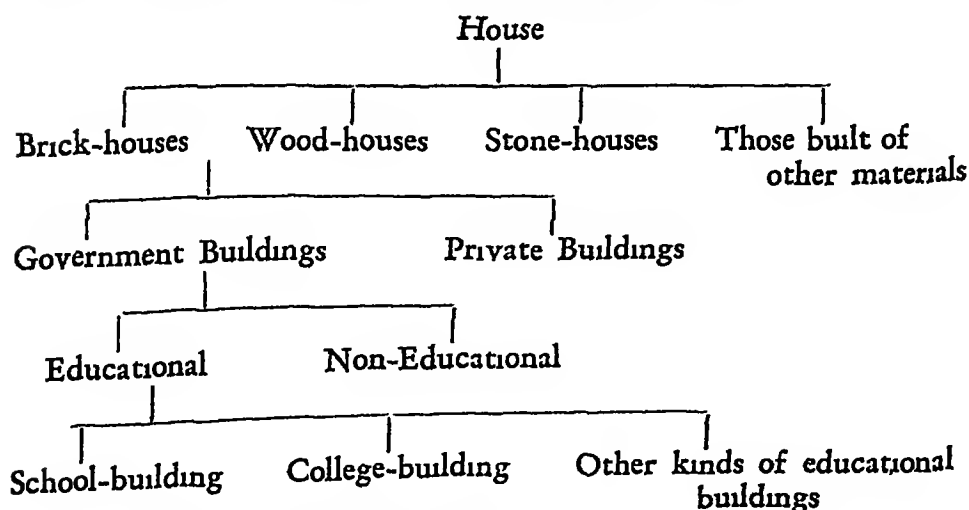
2 Test the following divisions.—

(1)   Triangles into equilateral, right-angled and   scalene

(2)   The world into Asia, Africa, Europe and America.

(3)   Terms into concrete, singular, positive and abstract.

A —(1) The term is logically divisible, but the division is not based upon one principle   The sub-classes of equilateral and scalene triangles are based upon the relation of sides, while the class of right-angled triangles upon the quality of angles   So the second rule of division is violated

(2)   The term is not divisible logically, for it is not a class-name   The division is a physical division

(3)   The term is logically divisible, but the division is made on more than one basis, and so it is a cross-division   A singular term can be concrete and positive, and also abstract, and similarly an abstract term can be singular and positive, and so on.

QUESTIONS AND EXERCISES

1   What are the rules of logical division?

Criticise and correct (where necessary)   the following divisions —

(*a*) Judgments into Affirmative, Negative, and Universal

(*b*) Men into civilised and uncivilised

(*c*) Inferences into Mediate Inferences, Inferences by Opposition, and   Inferences   by   Conversion   (A U, 1893)

Test the following by the rules of logical division —

(*i*) Buildings into buildings of stone, of brick, public buildings, religious buildings, churches and law-courts

(*ii*) Logical   propositions   into   affirmative,   negative   and universal

3   What are the tests of a correct logical division?   Illustrate your answer by making first a good and then a very bad division of books   (A U, 1897)

4   Test the following as divisions —

(*a*) Terms into singular, general, abstract and concrete.

(*b*) Sciences into physical, moral and medical

(*c*) Light into artificial light, sun-light, moon-light, and electric light. (A U, 1899).

5. What is logical division? Show that both definition and division are necessary to the complete understanding of the meaning of a common term   (A U, 1900).

6. What do you understand by logical definition and division? Why are these discussed in books on Logic?   (A U., 1901)

7. (*a*) State the rules of logical division

(*b*) Examine the following divisions:—

(*i*) The world into Asia, Africa and Europe

(*ii*) Books into entertaining and unentertaining.

(*iii*) Men into those who lend, and those who borrow.

(*iv*) Religion into Christian, Mohammadan, Hindu and Parsi.

8. (*a*) Define logical division.

(*b*) Can logical division be altogether formal?

(c) Give an example of logical division which is either purely formal or the nearest approach to it

9. Distinguish between logical and other kinds of division. Explain and illustrate what is meant by Cross Division   (A. U., 1908).

10   What do you understand by Physical Division, Logical Division, *Fundamentum Divisionis*, Cross Division?

Explain clearly what is meant by Division by Dichotomy, and estimate the value of the method   (A. U, 1912).

11   Make a division of a rectilineal figure to include Square, Polygon, Rhombus, Triangle, Parallelogram, and give the logical definition of each   (A U, 1914)

12. What do you understand by physical division, logical division, basis of division, cross-division? Explain what is meant

by Division by Dichotomy, and estimate the value of the method (A U, 1917)

    13   Criticise the following as logical divisions —

    (*a*) India into North India, the Deccan, the Malabar Coast, and the Carnatic

    (*b*) Indian languages into Aryan, Dravidian and others

    (*c*) Games into those played with balls, and those played without balls

    (*d*) Men into those who lend, and those who borrow.

    14   Distinguish carefully between division and classification and show their use in scientific enquiry

    15.   "In defining we divide, and in dividing we define"—Explain in what sense is this true, and illustrate your answer   (A. U, 1923)

    16   Explain fully how definition and division are related, and criticise the following divisions —

    (*a*) Living beings into moral, immoral, and sinners.

    (*b*) Substances into material, spiritual and solid.

    (c) Students into idle, atheletic, intelligent and quarrelsome (U I B, 1927)

    17   What is the purpose of logical division and what conditions should it fulfil? Criticise the following —

    (*a*) Mankind into man, women, and children

    (*b*) Logic into terms, propositions and inferences

    (*c*) Terms into connotative and proper names   (N U, 1930)

PART III
PROPOSITIONS

CHAPTER I
DEFINITION AND KINDS OF PROPOSITIONS

1   DEFINITION OF A PROPOSITION

We have said that an act of thought is called a judgment. *A judgment expressed in language is called a proposition.* A proposition has usually a subject, a predicate, and a copula. That about which something is affirmed or denied is called *the subject*   That which is affirmed or denied about the subject is called the *predicate,* while that which expresses connection between the subject and the predicate is called *the copula.* The copula is always in the present tense of the singular or the plural of the verb 'to be,' i e , either 'is' or 'are' according as the subject is in the singular or the plural form

2   KINDS OF PROPOSITIONS

Propositions have been classified as follows.—
According to —

I—Relation. { 1   Categorical or Absolute Propositions,
                    S is P
                 2   Conditional

{ (*a*) Hypothetical, If
        S is, P is
  (*b*) Disjun c t i v e,
        Either A is B,
        or it is C.

II—Quality. { 1.   Affirmative, S is P.
              { 2.   Negative, S is not P.

III—Quantity. { 1.   Universal, All S is P.
              { 2.   Particular, Some S is P.
              { 3.   Indesignate, S is P.

IV—Modality. { 1.   Assertory, S is P.
             { 2.   Necessary, S must be P.
             { 3.   Problematic, S may be P.

In the above exmples 'S' stands for the subject and 'P' for the predicate.

Now we shall explain these different kinds of propositions in detail.

3. CATEGORICAL OR ABSOLUTE PROPOSITIONS

In these the predicate is simply, (i.e., without a condition), affirmed or denied of the subject.

(i) *Quality and Quantity of Categorical Propositions.*—

According to Quality, every categorical proposition is either (a) *Affirmative*, or (b) *Negative*.

(a) *An Affirmative Proposition* is one in which the predicate is affirmed of the subject, the symbolical form being S is P,—Men are mortal.

(b) *A Negative Proposition* is one in which the predicate is denied of the subject, the form being S is not P, or 'No S is P,'—Men are not angels; No men are angels   The negative particle 'not' is put with the copula, and the words 'No,' 'none,' etc., immediately before the subject.

According to Quantity, a categorical proposition is   (*a*) Universal, (*b*) Particular, (*c*) Indesignate.

(*a*) *A Universal Proposition* is one in which the predicate is affirmed or denied of the whole of the subject, or one in which the subject is taken in its entire extent   The sign of universality is put before the subject, and is expressed usually by the words 'all,' 'every,' 'every one,' 'all the cases,' etc , in case the proposition is affirmative, and by the words 'no,' 'none,' 'no one,' 'no case,' etc , if the proposition is negative, e g , All S is P,—All men are mortal, No S is P,—No man is immortal.

(*b*) *A Particular Proposition* is that in which the predicate is affirmed or denied of only a part of the subject, that is one in which the subject is taken only in its partial extent. The sign of particularity is put before the subject, and is usually the words 'some,' 'in some cases,' etc   For example

Some S is P,—Some men are wise

Some S is not P,—Some men are not wise

In some cases, S is P,—In some cases, a trip to the hills is good for health

(*c*) *An Indesignate or Indefinite Proposition* is that in which the quantity of the proposition is not expressed For example

S is P,—Birds are feathered

S is not P,—Men are not feathered

It may be noted that indesignate or indefinite propositions really do not figure in actual thought   Unless it is

not possible to do so for want of knowledge, we are always able to determine the quantity of propositions. For example, in the above examples we know that 'Birds are feathered' is equal to 'All birds are feathered,' and that 'Men are not feathered' is equal to 'No man is feathered', that is to say, both of them are universal propositions.

(*ii*) *The Four-Fold Scheme of Propositions.*—By combining the division of propositions according to quality and quantity we get four kinds of propositions which have been technically called A, E, I, and O. They are as follows:—

1. *Universal Affirmative* (A), All S is P, All men are mortal—(S a P.)

2. *Universal Negative* (E), No S is P, No man is immortal,—(S e P.)

3. *Particular Affirmative* (I), Some S is P., Some men are wise,—(S i P.)

4. *Particular Negative* (O), Some S is not P, Some men are not wise,—(S o P.)

(*iii*) *Distribution of Terms*—When a term is taken in its entire extent or denotation it is said to be *distributed,* and when it is taken in its partial extent it is said to be *undistributed.* Now let us see which terms in the four kinds of propositions are distributed, and which of them are undistributed.

In the Universal Affirmative—A, for example, in 'All men are mortal' we find that:

(a) The subject is *distributed*, for it refers to the whole class of men

(b) The predicate is *undistributed*, for either only a part of the class of mortal beings is predicated of the subject, or the denotation of the predicate is left indefinite

Mortals

Men
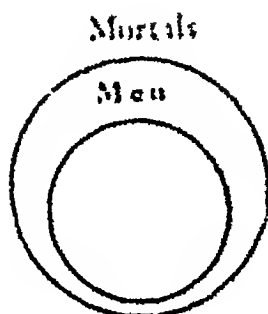
In the Particular Affirmative—I, for example, in 'Some men are wise' we find that

(a) The subject is *undistributed*, for only a part of the class of men has been taken into consideration

Men   Wise beings
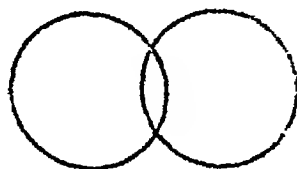
(b) The predicate is also *und i s t r i-buted* for the same reasons as the predicate of a universal affirmative proposition.

In the Universal Negative—E, for example, in 'No man is immortal,'

(*a*) The subject is *distributed*, for the entire class of men falls outside the class of immortal beings

Men   Immortal beings
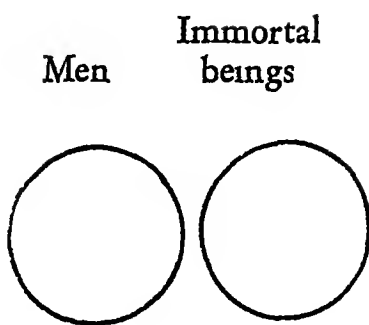
(*b*) The predicate is also distributed, for the entire class of immortal beings is outside the circle of men.

In the particular Negative—O, for example, in 'Some men are not wise,'

(*a*) The subject is *undistributed* for it is taken in its partial extent.

(*b*) The predicate is *distributed*, for the entire class of wise beings has been denied of the subject

Wise beings   Men
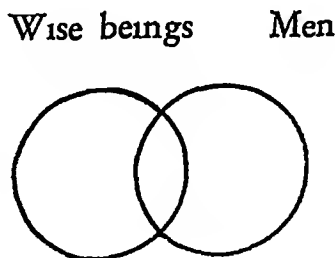
We may sum up the results as follows —

(1) *Universals*—*A and E have their subject* distributed

(2) *Negatives*—*E and O have their predicate* distributed

(3) *Particulars*—*I and O have their subjects undis-tributed.*

(4) *Affirmatives—A and I have their predicates un-distributed*

'(*iv*) *Quantification of the Predicate*—In the four-fold scheme of propositions we find that the sign of quantity is attached to the subject only. Now the doctrine of the Quantification of the Predicate requires that the sign of quantity should be attached to the predicate also. The chief supporter of this view is Sir William Hamilton. This adding of a sign of quantity makes eight forms of a categorical proposition —

$\Big\{$ (1) All S is all P   (U)
        (2) All S is some P   (A)

$\Big\{$ (3) No S is any P   (E)
        (4) No S is some P   (*n*)

$\Big\{$ (5) Some S is all P   (Y)
        (6) Some S is some P   (I)

$\Big\{$ (7) Some S is not any P   (O)
        (8) Some S is not some P   (*w*)

The doctrine of the Quantification of the Predicate has been criticised severely and has not secured recognition. An examination of the eight forms of propositions given above will show that —

Firstly, it is not at all natural to quantify the predicate, for in actual thought we take the predicate in its *intension*, and the quantification of the predicate is based upon the false assumption that we take it in *extension*.

Secondly, some of the forms obtained by the quantification of the predicate are redundant, for if we take both

the subject and the predicate even in extension the following are the only possible forms:—

(1) Where the class denoted by the subject coincides with the class denoted by the predicate —All S is all P, (U).

(2) Where the class denoted by the subject is altogether outside the class denoted by the predicate—No S is no P, (E).

(3) Where a part of the class denoted by the subject falls within the class denoted by the predicate —Some S is some P, (I).

(4) Where the whole class denoted by the subject falls within the class denoted by the predicate— All S is some P, (A).

(5) Where a part of the class denoted by the subject falls outside the whole class denoted by the predicate—Some S is not any P, (O).

Out of the five the last four are the usual forms of A, E, I and O propositions   The first form, where there is an identity between the subject and the predicate, rarely figures in thought and comes under A as a special form of it.

4.   HYPOTHETICAL PROPOSITIONS

In hypothetical propositions there is   (a)   an Antecedent or Protasis, and (b) a Consequent or Apodosis.

The Antecedent or Protasis lays down the condition upon the fulfilment of which the truth of the consequent

follows   The clause which forms the antecedent is introduced by the word 'If '

The Consequent or *Apodosis* is the statement of the result which follows upon the   fulfilment   of   the   condition contained in the antecedent.   For example, in the proposition   'If rain falls, it will become cold,' 'if rain falls' is the antecedent, and 'it will become cold' is the consequent

(*1*) Quality and Quantity of Hypothetical Propositions —The quality of hypothetical propositions is   to   be judged from the consequent.   If the clause   expressing   the consequent is affirmative, the proposition is affirmative, if it is negative, the proposition is   negative   The   quantity   of hypothetical propositions may be judged from either the antecedent-clause or the consequent-clause

Thus on the basis of quality and quantity we get the following forms of hypothetical propositions —

(*a*) *Universal Affirmative*   If A is B, C is D,—If rain falls, corn will become cheap

(*b*) *Particular Affirmative*   If A is B, in some cases, C is D,—If rain falls, in some cases, corn becomes cheap

(*c*) *Universal Negative*   If A is B, C is never D — If rain falls, corn is never dear

(*d*) *Particular Negative*   If A is B, in some cases C is not D,—If rain falls, in some cases, corn is not dear.   Or, in some cases, if A is B, C is not D, in some cases, if rain falls, corn is not dear

(*u*) *Relation of Hypothetical Propositions to Categorical Propositions* —Some logicians think that the distinction between a categorical and a hypothetical proposition is merely of form, and that any of the two kinds might be reduced to the form of the other without a change of meaning. But it is a mistake to think so. The two kinds of propositions are essentially different in nature While the categorical proposition makes a mere statement of truth or falsity about some fact or facts, the hypothetical proposition affirms or denies the truth of some fact or reality on the fulfilment of a certain condition mentioned in the antecedent. For example, if we reduce the hypothetical proposition 'If rain falls, corn becomes cheap' to the categorical form· 'The case of the falling of rain is the case of corn becoming cheap,' the original meaning of the hypothetical proposition is distorted a good deal, although it is still present in the categorical form. The hypothetical form refers to *a mere possibility* of the truth of what is said in the consequent upon the fulfilment of the condition mentioned in the antecedent, and *this possibility may or may not be realised at all* Rain may fall or may not, and consequently, corn may or may not become cheap On the other hand, the categorical form *makes a definite statement* with regard to the truth or falsity of some fact. The proposition 'Men are mortal,' definitely says that 'mortality' is true of 'men' as a fact.

5. DISJUNCTIVE PROPOSITIONS

Disjunctive propositions are those which make a predica-

tion of two or more alternatives   The typical forms are as follows —

(1) Either A is B or C, or Either A is B, or A is C.

(2) Either A is B, or C is D.

(3) Either A or B is C, or Either A is C, or B is C

As to the function of a disjunctive proposition it may be said that it aims at giving the arrangement and content of a system   The subject is usually a genus, "and the alternative predicates are the species   which   together   compose that genus.   In such a case it is evident that those predicates are mutually exclusive and collectively   exhaustive   of   the denotation   of   the   subject   The   disjunctive   judgment is the form appropriate to the statement of a complete and perfect classification of the denotation of its subject."[1]

(*i*) *Quality and Quantity of Disjunctive Propositions.*— By their very nature   the disjunctive propositions   are always affirmative, for from among a number of alternative predicates one must be affirmed of the subject.

A really disjunctive proposition must be   always   universal   However, we may   make   formal   distinctions   of quantity, and then the forms are as follows —

(1) *Universal*—Every A is either B or   C,   Every student is either successful or unsuccessful

(2) *Particular*—Some A's are either B or C, Some students are either athletic or good at studies.

(*ii*) *Relation of Disjunctive Propositions   to   Hypothetical Propositions* —A disjunctive proposition may be reduced

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[1] *Intermediate Logic,* p 109

to two or more hypothetical propositions according as the alternatives stated in the disjunctive propositions are mutually exclusive or not.   For example, the proposition: 'A is either B or C' may be expressed by means of the following hypothetical propositions, in case the alternatives B and C are mutually exclusive:—

> (1) If A is not B, A is C.
>
> (2) If A is C, A is not B
>
> (3) If A is not C, A is B.
>
> (4) If A is B, A is not C.

If the alternatives are not mutually exclusive, there will be only two forms, viz., (1) and (3).

However, it is to be noted that disjunctive and hypothetical propositions have different signification, and it is by no means correct to think that the hypothetical forms to which a disjunctive proposition is reduced have the same significance as the original proposition. "For, they are not four independent hypothetical judgments, and their force is not appreciated, unless it is seen that together they make up a disjunction, that they offer us a choice between alternative hypotheses   Thus disjunctive judgment at once includes, and goes beyond hypothetical, in the same sort of way as hypothetical judgment includes and goes beyond categorical   A hypothetical judgment makes an assertion, like a categorical, but what it asserts is a relation of a consequent to a condition. A disjunctive judgment involves hypotheticals, but it presents

them as alternatives and asserts the truth of one or other of them "

6 SOME FURTHER DISTINCTIONS AMONG PROPOSITIONS

(*i*) *Analytic and Synthetic Propositions* —An *Analytic Proposition* is that in which what is said in the predicate is already contained in, or forms the connotation of the subject. The proposition is called analytic for the predicate gives a partial, or the whole analysis of the connotation of the subject; e g , 'Material bodies are extended,' 'Man is rational,' etc. Analytic propositions have also been called *Explicative, Verbal,* or *Essential*

A *Synthetic Proposition* is that in which what is said in the predicate is something beside the accepted connotation of the subject, and is supposed to have given some new information about it, e g , 'Men are social beings,' 'Tennis is a good game,' etc   Synthetic propositions are also called *Ampliative, Real,* or *Accidental*

(*ii*) *Exceptive and Exclusive Propositions   Exceptive Propositions* are those in which a part of the subject is excepted or excluded in making the predication, e g., 'All except First Year students are eligible for competitive examination,' 'All except a few went away after the sunset,' 'No one except the Fourth Year students are to come.' Exceptive propositions, when put into a proper logical form, are universal affirmative or universal negative, according to the meaning of the proposition

9

Exclusive Propositions are those in which every other thing besides that denoted by the subject is excluded from predication, e.g., 'None but the brave deserves the fair,' 'Only graduates are to apply for the post.' The logical form of exclusive propositions is invariably universal negative, i.e., E, 'No non-S is P.'

In exceptive propositions, the words 'unless,' 'except,' and 'but' are usually used to denote exception.

In exclusive propositions, the words 'alone,' 'only,' 'none but,' 'none except,' 'none who is not' are generally employed to denote exclusion.

(*iii*) *Singular and General Propositions.*—*Singular Propositions* are those in which the subject denotes a particular individual object, e g , 'London is a big city,' 'This man is very wise.'

General Propositions are those in which the subject denotes a class to the individual members of which the predicate refers, e.g., 'Monkeys are clever animals.'

Singular and General propositions are the two divisions of a Universal Proposition.

(*iv*) *Plurative Propositions* are those the quantity of which is generally expressed by the use of such words as 'most,' 'almost,' 'few,' 'hardly,' and 'scarcely.' All these are to be put down as particular propositions when rendered into logical form. 'Most S's are P,' and 'Almost all S's are P' are to be rendered as 'Some S's are P,' while the words 'few,' 'hardly,' and 'scarcely' have a negative force, and the

propositions 'Few men are religious,' 'Hardly any man is religious,' and 'Scarcely any man is religious' have the same significance, and are to be treated as an 'O' proposition: 'Some men are not religious.'

It must be noted that the proposition 'Few S's are not P' is really equivalent to an 'I' proposition,—Some S's are P

(v) *Compound Categorical Propositions* are those which contain more than one proposition in a single statement. These are of the following kinds —

(a) *Compound in Form* —These may be divided into three classes —

(1) *Copulative Propositions*, those in which there are two or more affirmative propositions, and there are either two or more subjects, or two or more predicates, or a plurality of both, for example —

(a) S and O are P, Rama and Govinda are honest
(b) S is P and Q, Rama is honest and brave
(c) S and O are P and Q, Rama and Govinda are honest and brave

The above propositions are equivalent to the following respectively —

(a) S is P, and O is P, Rama is honest, and Govinda is honest
(b) S is P, and S is Q, Rama is honest, and Rama is brave
(c) S is P, S is Q, O is P, and O is Q,—Rama is

honest; Rama is brave, Govinda is honest; and Govinda is brave.

(*ii*) *Remotive Propositions* are those in which there are two or more negative propositions, for example.—

(*a*) No S or M is P, No European or American is black.

(*b*) No S is either P or Q, No European is either black or brown.

(*c*) No S or M is either P or Q, No European is black, No European is brown, No American is black; No American is brown.

(*iii*) *Discretive Propositions* are those in which two affirmative propositions are joined by an adversative conjunction, such as 'but,' 'nevertheless,' 'although,' etc Here some opposition is implied between the propositions joined, which are not expected to be true together Thus 'He is poor but honest' would imply that "most poor people are not honest "[1]

(*b*) *Exponible Propositions* are "those where composition is not obvious from their forms, and which, therefore, require explanation to show what this hidden composition really is."[2] They have been classed as (*a*) *Exclusive Propositions*, (*b*) *Exceptive Propositions*, and (*c*) *Inceptive and Desitive Propositions* The first two, (*a*) and (*b*) have already been explained above

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[1] Welton, *Manual of Logic*, p 178

[2] Ibid., p 179

Inceptive and Desitive Propositions state the beginning or the end of something   They can be analysed into the propositions, the one stating the state of things before a certain change, and the other, the state after the change, e g , 'The price of wheat was very low before the Great War.' This implies   (1) the price of wheat was low before the Great War, and (2) the price of wheat became high during, or after the Great War

HINTS AND EXAMPLES

HINTS

In order to put a sentence into the form of a logical proposition proceed as follows —

(1) *Find out whether the proposition is to be (a) categorical, (b) hypothetical, or (c) disjunctive*   This is to be ascertained by considering the meaning of the sentence   If it means to   make   a mere assertion, the proposition is to be *categorical,* if it implies some condition upon the fulfilment of which the truth of some fact follows, it is *hypothetical,* and lastly, if it means to present some alternatives it is *disjunctive*

(2)   If the proposition is categorical *find   out   the   subject and the predicate, and provide a copula* which has to be the singular or the plural form of the verb 'to be' in the present tense

If the proposition is hypothetical, find out the antecedent and the consequent

If it is disjunctive, find out the alternatives

(3) *Find out the quality and quantity of the proposition, and put it under one of the four forms of A, E, I and O*

It must be remembered that the right clue to the determination of the quality and quantity, as of every thing else, with regard to

propositions, is to be found in the *meaning* of the original sentence and the student is advised to carefully consider that before translating a sentence into logical form. Certain expressions such as 'Not all,' 'All are not,' 'Few,' etc., are deceptive, and so it is very important that their implications should be thoroughly understood. The meaning of some of the important signs of quality and quantity are given below for guidance

The following are the most usual forms:—

(*i*) *Universal Affirmative Propositions—A*

(*a*) *All*, All S's are P, All men are mortal

(*b*) *Every, or Every one*, Every S, or Every one of S's is P, 'Every man there (or every one of those men) is good'

(*c*) *Any*, Any S is P, Any man can do this

(*d*) *Alone and only*, (*i*) S's *alone* are not P ⎫ =All not—S's
                (*ii*) *Only* S's are not P ⎰ are P (A), or
                            also to No S is P (E)

(*i*) Undergraduates *alone* are not eligible ⎫ both of them
(*ii*) *Only* undergraduates are not eligible ⎰ being equal to 'All non-undergraduates are eligible' (A), or also to 'No undergraduates are eligible' (E)

It is to be noted that all the forms in (*b*), (*c*), and (*d*) have to be reduced to that in (*a*) when a sentence is put into logical form

(*ii*) *Universal Negative Propositions—E*

(*a*) *No*, No S is P, No man is immortal

(*b*) *None of*, None of S's is P, None of these students is intelligent

(*c*) *Not a single*, Not a single S is P, Not a single man went there

(*d*) *Only*, Only S is P ⎫
    None-except, None except S is P ⎬ =No not— S is P
    None but, None but S is P ⎭
                   No non-graduate is eligible

All the forms in (*b*), (*c*), and (*d*) have to be reduced to that in (*a*), No S is P

(*iii*) *Particular Affirmative Propositions*—I

(*a*) *Some*, Some S's are P, 'Some men are wise'

(*b*) *Few are not*, Few S's are not P, which is equal to Some S's are P, 'Few men are not wise,' being equal to 'Some men are wise' The word 'few' has got a negative force, and it being combined with another negative 'not' gives an affirmative meaning

(*c*) *A Few are*, A few S's are P, A few men are intelligent

(*d*) *Hardly any are not* $\left.\begin{array}{l}\\\end{array}\right\}$ =Some are
    Scarcely any are not

'Hardly (or scarcely) any man is not hungry' being equal to 'Some men are hungry'

(*e*) *Only some*, Only some S's are P, Only some men are wise

(*f*) *All except one*, 'All S's except one are P' being equal to 'Some S's (most) are P'

(*g*) *No, or none except one*, 'No S (or none of S's) except one is P, being equal to 'Some S (one) is P'—(I), and also '(Some) S's (most) are not P'—(O)

All the forms have to be reduced to the form of (*a*) above

(*iv*) *Particular Negative Propositions*—O

(*a*) *Some are not*, Some S's are not P, Some men are not wise

(*b*) *All are not* $\left.\begin{array}{l}\\\end{array}\right\}$ =Some are not
(*b*) *All are not*

All S's are not P $\left.\begin{array}{l}\\\end{array}\right\}$ =Some S's are not P
Every S is not P

All metals are not precious $\left.\begin{array}{l}\\\end{array}\right\}$ =Some metals are not
Every metal is not precious   precious

(*c*) *Few are*=Some are not

Few S's are P, being equal to Some S's are not P

Few men are wise, being equal to Some men are not wise.

` The proposition is O, because the word 'few' has a negative force

(d) *A few are not*=Some are not.

A few S's are not P=Some S's are not P

A few men are not generous=Some men are not generous

(e) *Hardly any are*
Scarcely any are } =Some (most) are not

Hardly any S's are P
Scarcely any S's are P. } =Some S's are not P

Hardly any men are prudent } =Some men are not
Scarcely any men are prudent } prudent.

(f) *Only some are* } =Some are not—(O)
Some alone are } [and also 'some are'—(1)]

Only some students are clever } =Some students are
Some students *alone* are clever } not cleaver—(O), and
also 'Some students are clever'—(I)

(g) (1) *All except one* } (1) Some (one)
                             is not. }
                                                } = } O
     (2) *No or none except one* } (2) Some (most)
                                      are not }

[and also (1) Some (most) are }
           (2) Some (one) are } I]

All men except one went away   { =Some men (one or most
  No man (or none of the men) }   of them) did not go
  except one went away   away

and also the affirmative (I) proposition 'Some men (most or one) went away.'

(4) If the sentence is complex or compound, resolve it into simple sentences, and then put them into a logical form

EXAMPLES

Q —Put the following statements into proper logical form.—

(1) Few men are really wise

(2) Any man can read this book

(3) All that glitters is not gold

(4) Graduates alone need apply for the post

(5) Any man cannot go there

(6) Only a few men are wanted

(7) Only logicians can solve this problem

(8) Not all who try succeed

(9) Few men have not suffered

(10) Nearly every body failed

(11) Shall we submit to such tyranny as this?

(12) All terms are words, but all words are not terms

(13) No rains, no cheap corn

(14) Govinda must be one of the two—either very brave or very coward

(15) Uneasy lies the head that wears a crown

A —The logical forms are as follows —

(1) 'Few are'=Some are not (O)   So the proposition is 'Some men are not really wise'

(2) 'Any'='all' in this statement
Logical form   'All men are who can read this book '—(A)

(3) 'All is not'='Some are not' Logical   form   'Some things that glitter are not gold '—(O)

(4) 'Alone' signifies exclusion of every thing else besides the subject, and so the proposition is to be an exclusive one   Logical form   'No non-graduates are those who need apply for the post '—(E)

N B —According to some logicians this statement can also imply an A proposition, viz, 'All graduates are those who can

apply for the post' But a little thought will show that this form is hardly justifiable on the strength of the original statement

(5) 'Any cannot' is equal to 'some cannot.' Logical form· 'Some men are not capable of going there.'—(O)

(6) 'A few' is equal to 'some' Logical form 'Some men are wanted'—(I)

(7) 'Only' has got an exclusive force and the statement is therefore to be rendered into the form of an exclusive proposition.

Logical form 'No non-logicians are those who can solve this problem'—(E)

(8) 'Not all' is equal to 'some not' Logical form 'Some persons who try are not those who succeed'—(O)

(9) 'Few are not'='Some are' Logical form 'Some men are those who have suffered'—(I).

(10) 'Nearly every'='Some' (most) Logical form 'Some men are those who failed'—(I)

(11) The question embodied in this statement implies a negative meaning and the sentence is equal to "None of us is prepared to submit to such tyranny as this" Logical form 'None of us is prepared to submit to such tyranny as this'—(E)

(12) This statement consists of two sentences —

(*a*) All terms are words

(*b*) All words are not terms

The first of these is clearly an A proposition

The second of them when put into logical form is "Some words are not terms"—an O proposition

(13) This statement is conditional in meaning and amounts to saying "If there are no rains, corn will not be cheap" Thus the proposition is a hypothetical one, the first clause being the antecedent, and the second the consequent

(14) This statement presents two alternatives about

Govinda   He is either (*a*) very brave, or (*b*) very coward, and so it will make a disjunctive proposition   "Govinda is either very brave or he is very coward "

(15)   In this statement "the head that wears a crown" is the subject, and "lies uneasy" is the predicate   Thus the sentence is "The head that wears a crown lies uneasy "

Logical form   "All the heads that wear a crown are those which lie uneasy"—(A)

QUESTIONS AND EXERCISES

1   What is meant by the Quantity, Quality and Relation of a judgment?

Give the quantity, quality and relation of the following, and the vowels that may be used as symbols of them —

(*a*) The Chinese are Asiatics

(*b*) Not every tale we hear is to be believed

(*c*) Knowledge is power   (A U , 1893)

2   Ascertain the logical characters of each of   the   following —

(*a*) Socrates is the son   of Sophroniscus

(*b*) All poets are not men of genius

(*c*) Some elements are metals

(*d*) None but the virtuous are happy

(*e*) No man is infallible

(*f*) Some men are not prudent   (A U , 1894)

3   Define Judgment   What is the difference between a hypothetical judgment of the form—If A is B, A is C and one of the form—If A is B, C is D   (A U , 1894)

4   Give the Quantity, Quality and Relation of the following judgments —

(*a*) Locke is the greatest of English metaphysicians

(*b*) Some elements are all the metals

(c) Some expedient acts are just

(d) No good act is without its reward.

(e) All men are not capable of acting wisely   (A U, 1894).

5   What is the copula in a proposition?   State clearly what the coupla expresses   In the proposition 'The sun rises' which is the coupla, which the subject, and which the predicate?

On what grounds are propositions divided into (a) Categorical, and conditional (b) Affirmative and Negative, (c) Universal and Particular

Classify the following propositions according to   the   above heads —

(a) If A is not B, C is D

(b) Every day is not Sunday.

(c) Uneasy lies the head that wears a crown   (A U., 1895)

6   What is meant by the distribution of a term?   Illustrate your answer by means of the predicate of an I and O proposition. (A U, 1896).

7   Express the following propositions in their simplest logical form, and give their quantity and quality

(a) Any house is a shelter in a storm

(b) 'Tis only noble to be good

(c) All is not gold that glitters.

(d) The highest mountain in the world is Mount Everest

(e) A bird in the hand is worth two in the bush

(f) It is hard to leave home or country   (A U, 1896).

8   How is the subject of a proposition to be distinguished from the predicate?

Point out the subject and   the   predicate   of   the   following propositions and determine their quantity and quality —

(a) It is mostly the boastful who fail

(*b*) To be or not to be, that is the question

(*c*) Uneasy lies the head that wears a crown

(*d*) Where there is a will there is a way

(*e*) Whosoever is delighted in solitude is either a wild beast
       or a god   (A U, 1897)

9   What is meant by the distribution of a term in a proposition? If it be known concerning a proposition that (*a*) one and only one term is distributed, and (*b*) neither term is distributed, determine the subject and predicate of such a proposition   (A U, 1898)

10   How many propositional forms are ordinarily recognised by Logic? What additions to the ordinary scheme were proposed by Hamilton and on what grounds? Justify or controvert the Hamiltonian Scheme

11   What is meant by the Quantity and Quality of a proposition? State the quantity and quality of the following, in each case, giving reasons for your answer

(*a*) Roses grow in Persia

(*b*) Wealth is not the highest good

(*c*) Certain Greek philosophers were the founders of
       Logic

(*d*) Few men know how little they know   (A U, 1902)

12   Point out the quantity and quality of the following propositions reducing them to their logical form —

(*a*) Gentle words are always a gain

(*b*) I alone have found the truth

(*c*) All is not repetition that at first seems so

(*d*) Few men are free from vanity   (A U, 1903)

13   Determine the quantity and quality of the following propositions —

(*a*) Men usually rise and fall to the level of their repu-
       tation

(b) Of all the forms of government democracy is by far
the most difficult

(c) If university gives stimulative teaching, it does every-
thing, if it fails to do this, it does nothing

(d) There never was a sea-serpent   (A U, 1904)

14   Express the following propositions in exact logical form
and say which terms are distributed

(a) No one looks poetical unless he is pale

(b) Some dishes are unwholesome when not well-cooked

(c) Uninteresting books make us sleepy.

(d) When a man is wide awake, he can detect a fraud

(e) No riddles interest me, if they can be solved

(f) Only fools think themselves infallible   (A U, 1916).

15   Resolve the following propositions into logical forms and
indicate the Quality and Quantity of each resulting proposition

(a) Bombay is the only town in India except Calcutta which
has a population of a million

(b) Only the brave deserve the fair

(c) Hardly any of the candidates took a first division

(d) It is as false to say that the Bengalees alone among the
Indians are versatile, as to say the Bengalees alone are
not   (A U, 1918)

16   Express the following propositions in logical forms, dis-
tinguishing subject, copula, and predicate, and stating the quality
and quantity —

(a) Only fools think themselves infallible

(b) All politicians are not statesmen

(c) Few persons are proof against temptation

(d) Nearly all the troops have left the town

(e) Uneasy lies the head that wears a crown

(*f*) Not every man can stand such hardships

(*g*) A burnt child dreads the fire   (A U , 1922)

17   Explain what is meant by the distribution of terms and discuss fully the four standard types of categorical propositions from the point of view of the distribution of terms   (A U , 1923)

18   What is meant by a disjunctive proposition? Are the alternatives in such a proposition mutually exclusive or not? Discuss this question and show that the analysis of a disjunctive syllogism depends upon the answer to this question   (U P I B , 1929)

19   What are the various ways of classifying propositions? Explain the nature of the various forms of propositions, and give examples   (U P I B , 1930)

20   (*a*) What is meant by calling judgment 'the unit of thought'?

(*b*) Distinguish between judgment,   proposition   and sentence   (N U , 1931)

CHAPTER II
IMPORT OF PROPOSITIONS
1. The Import of Propositions

The import of propositions is the interpretation of predication in a proposition, that is to say, of the meaning of the subject and the predicate, and also, of the relation in which they stand to each other with regard to their extension and intension. There has been a good deal of difference of opinion on this subject among logicians. They differ with regard to (1) the relation between S and P—the subject and the predicate; and (2) the way in which S and P, the subject and the predicate, are to be interpreted.

Dr. Ray gives an admirable summary of the views of important logicians on the first point, and we take the liberty of reproducing it here. "As regards the first point', says he, 'Hamilton for instance recognises the relation of containing or not-containing (inclusion or exclusion) either in the quantity of extension or in the quantity of comprehension, arising from the 'relation of congruence or confliction' Mansel holds that the two sets of attributes expressed by A and B (the subject and the predicate) must be capable of existing together in some possible object of intuition, that is, the relation of A and B is that of compatibility or incompatibility According to Uberweg the relation of A and B must correspond

to an objective relation, that is, to a relation really existing among things   Martinue recognises the relation of substance and attribute, and also, the relations of time and space, of cause and effect, and of resemblance and difference   Mill gives the relations expressed by all propositions under five heads   (1) Existence, (2) Co-existence, (3) Succession, (4) Causation, (5) Resemblance   Bain includes all under three classes   (1) Co-existence, (2) Succession, (3) Equality or Inequality."

The Theories of Predication

The different theories with regard to the meaning of the subject and the predicate in a proposition may be classified as follows

(1) *The Ordinary or Predicative view,* according to which S, the subject, is taken in its extension (denotation), and P, the predicate, in its intension   (connotation)   In other words, *the relation between the subject and the predicate is that of subject (substance) and attribute.* It is to be noted that this is the most natural interpretation of a proposition   For, in thought we are generally interested in finding out for ourselves, or in communicating to others, the attributes which belong to the object or person denoted by the subject-term

(2) *The Denotative View,* according to which both S and P, the subject and the predicate, are taken in their extension (denotation)   This theory includes the following —

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(*a*) *Hobbes' View*—that the predicate is the name of that of which the subject also is the name, e g., Saul is Paul.

(*b*) *The Class-view or Class-inclusion View*—that the class or group denoted by S, the subject, is included in the class or group denoted by P, the predicate, e.g , the proposition 'Man is mortal' means that the class of human beings is included in the class of mortals.

(*c*) *The Equational View*—that the things denoted by the subject are the same as, or equal to those denoted by the predicate, e g., 'Ramachandra, Govinda and Paul are all the students of the M.A. class' With regard to the propriety of this interpretation of propositions it may be said that·—

Firstly, though it is possible to interpret the predicate in its extension, it is not at all natural to take it so in actual thinking For, as said before, we are usually interested in the connotation of the predicate

Secondly, this interpretation of propositions is based upon the wrong notion that our judgments are the result of a complete enumeration of instances

Thirdly, 'this view of predication neglects the essential unity of the judgment and regards it as stating a relation between two independent objects rather than as expressing an interpretation of one element or aspect of reality'—(Welton)

Fourthly, this does not fit in with the fourfold division of propositions into A, E, I and O, and we have to frame a five-fold scheme according to the Hamiltonian doctrine of the quantification of the predicate as follows —

(1) All S is all P   (U)
(2) All S is some P   (A)
(3) Some S is some P   (I)
(4) Some S is not any P   (O)
(5) No S is any P   (E)

"But it should be remembered," says Welton, "that we have here a statement of the actual relations which must hold, in fact, between two classes, not of our knowledge of those relations   This scheme, therefore, furnishes us with no means of expressing the very common state of doubt, when we know every S is P, but do not know whether or not any other objects are P as well   Moreover, each of the above propositions is singular, as each term is necessarily taken collectively   For both these reasons the scheme is inappropriate to the purposes of logic, and any interpretation of the proposition which, when strictly carried out, leads to it is thereby condemned "   (Welton's Manual of Logic)

(3) *The Comprehensive View*, according to which both S and P, the subject and the predicate, are taken in intension (connotation)   This theory of import means to say that the attribute, or attributes, which forms the connotation of the predicate is *contained* among the attributes which form the connotation of the subject   In other words, according to this view *the predicate is included in the subject*

This view is equally untenable along with the previous one for the following reasons —

Firstly, it is incorrect to say that the connotation of the

subject contains that of the predicate in every proposition, for, we know that sometimes the connotation of the subject is contained in that of the predicate.

Secondly, this view is based upon the false assumption that the connotation of a term includes *all* the attributes common to a class, and that all propositions are to be taken as analytic.

(4) *The Attributive or Connotative View*, according to which the predicate and the subject are both to be taken in connotation, but the relation between the two is not that of comprehension or inclusion, (as it is according to the last view) but that of *concomitance* That is to say, the proposition asserts as to *whether the attribute, or attributes, connoted* by *the predicate does, or does not go along with that or those connoted by the subject*

Mill adopts this view and is right in so far as he holds that the ultimate meaning of a judgment is to assert a relation of content.   But he is wrong in so far as he regards this relation of content as established by an enumeration of substances.   But this mistake was natural to Mill considering his position as an empiricist, that is to say, as one to whom experience derived through the senses is the only possible source of knowledge   Some logicians combine the comprehensive and the connotative views and call them by the common name of *Denotative-Connotative View*

3   THE DIAGRAMMATIC REPRESENTATION OF PROPOSITIONS

The representation of the meanings of propositions by

means of diagrams is based upon the interpretation of the subject and the predicate in denotation, that is to say, as denoting classes, of which the one is contained in the other.

Several kinds of diagrams have been devised, such as, those by Euler, Jevons, Uberweg, Lambert and Venn[1]. The most usual of these are by Euler known as Euler's Circles. They represent the meaning of the subject and the predicate of a categorical proposition when interpreted in extension.

Euler's Circles.—

(1) *A (Universal Affirmative) Proposition—All S is P;* The subject is either

    (*a*) coincident with the predicate

or (*b*) it is contained in the predicate as a part of it

So (*a*) and (*b*) are respectively represented as

    (*a*)   (b)
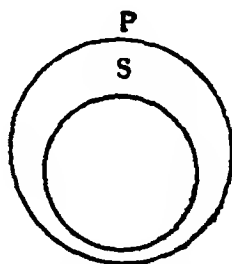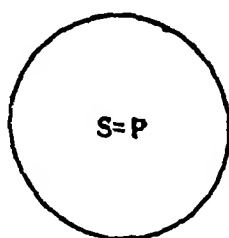
Examples (*a*) All equilateral triangles are equiangular.

           (*b*) All men are mortal.

(2) *E (Universal Negative)—No S is P* The subject and the predicate are completely outside each other

[1] See *Welton's Manual of Logic*, pp 216-224
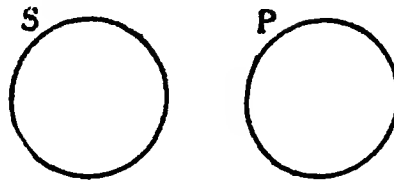
Example No man is immortal.

(3) I (*Particular Affirmative*)—*Some S is P.* The proposition asserts that (*a*) a part of the subject is contained in the predicate; but it does not deny the possibility of (*b*) the whole of the subject being included in the predicate, or (*c*) the coincidence of the subject with the predicate.

So (a) is to be expressed by two diagrams.

(1)
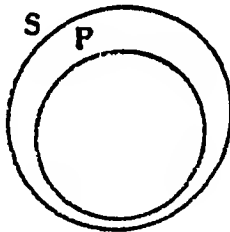
(2)
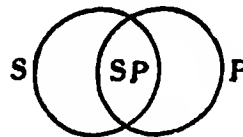
(b) is to be expressed thus:

(3)
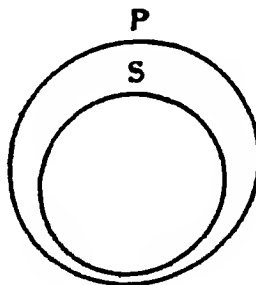
and (c) is to be represented thus

(4)
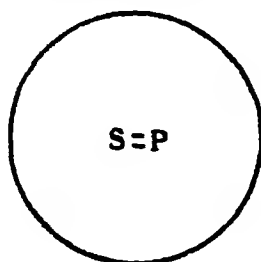
(4) O (*Particular Negative*)—*Some S is not P.* The meaning is (*a*) that at least a part of S is excluded from P. But it does not deny the possibility of (*b*) the total exclusion of S from P

The meaning in (*a*) is to be expressed by two diagrams:

(1)

(2)
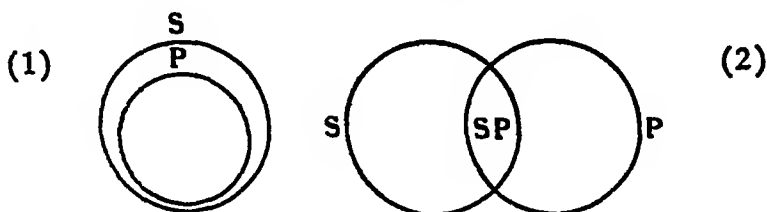
Here it will be noticed that these two diagrams are the same as represent the (*a*) meaning of an I proposition. However, they have to be interpreted differently, for—*in an I proposition,* we consider that part of S which either coincides with P, as in diagram (1), or that which coincides only with a part of P, as in diagram (2); while, *in an O proposition* we consider that part of S, which is *outside* the whole of P,

as in diagram (1), or that which is outside a part of P, as in diagram (2).

The meaning of (b) is to be expressed thus:
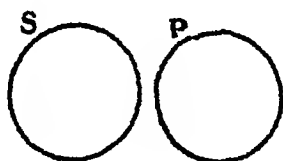
Thus we see that all the four forms of propositions are represented by five kinds of diagrams, and some of them are common to two or more of them. This has been regarded as a defect of Euler's circles. However, if we keep the meaning of propositions in mind, they perhaps, are the clearest of all others. Still, as indicated already, the very representation of propositions by means of these diagrams is questionable. For it is based upon the wrong view that subject and predicate are to be interpreted in extension according to the Denotative or Class-inclusion theory.

QUESTIONS AND EXERCISES

1. Bring out the meaning of the following accounts of the proposition "All wise men are modest," and say which is logically to be preferred —

   (a) All wise men have the attribute modesty

   (b) Wise men—modest men.

   (c) All wise men are included in the class modest men
      (A U., 1891)

2   State and explain any two of the principal theories of predication known to you   (A U, 1903)

3   State and explain by diagrams (as far as possible) any three different views as to the import of propositions   (A U., 1913)

4   What are the principle views which have been held of the import of proposition?   Which do you consider the most satisfactory and why?   (A U, 1915)

5   State the chief theories of the import of propositions   On what theory does the adoption of A, E, I, and O, as the fundamental forms rest?

6   Discuss the nature and use of diagrams as illustrating the relation between the terms in a proposition   What theory of the import of propositions is implicit in most diagrammatic schemes? (Questions on Logic)

7   Give a concise account of any schemes of diagrammatic representation of propositions, and discuss their value   (L B A)

8   Explain briefly Euler's system of diagrams.   Does it fairly represent the fourfold scheme of propositions?

9   Represent each of the following propositions by its appropriate diagrams and state its meaning according to the   various theories of predication and of the import of propositions —

      (*a*) All kings are men

      (*b*) No kings are perfect

      (*c*) Some men are honest

      (*d*) Some men are not truthful

10   (*a*) Discuss critically the Denotative or Class view of the Import of propositions   (*b*) Which theory do you consider most satisfactory, and why?   (N U, 1931)

CHAPTER III

THE OPPOSITION OF PROPOSITIONS

1. The Meaning of the Opposition of Propositions

The Opposition of Propositions means the relation between two propositions having the same subject and predicate, but differing in quality, or quantity, or both.

These relations exist, therefore, as follows:—

    (1) Between A and I

    (2)   „   E and O

    (3)   „   A and E

    (4)   „   I and O

    (5)   „   A and O

    (6)   „   E and I

These relations have been illustrated by means of a square, which has come to be known as the Square of Opposition.

It must be noted that the relations according to the Opposition of Propositions are not necessarily between such propositions only as are opposed or inconsistent in their meaning. A better name would be 'The Relation of Propositions'

2 THE SQUARE OF OPPOSITION

It is as follows —
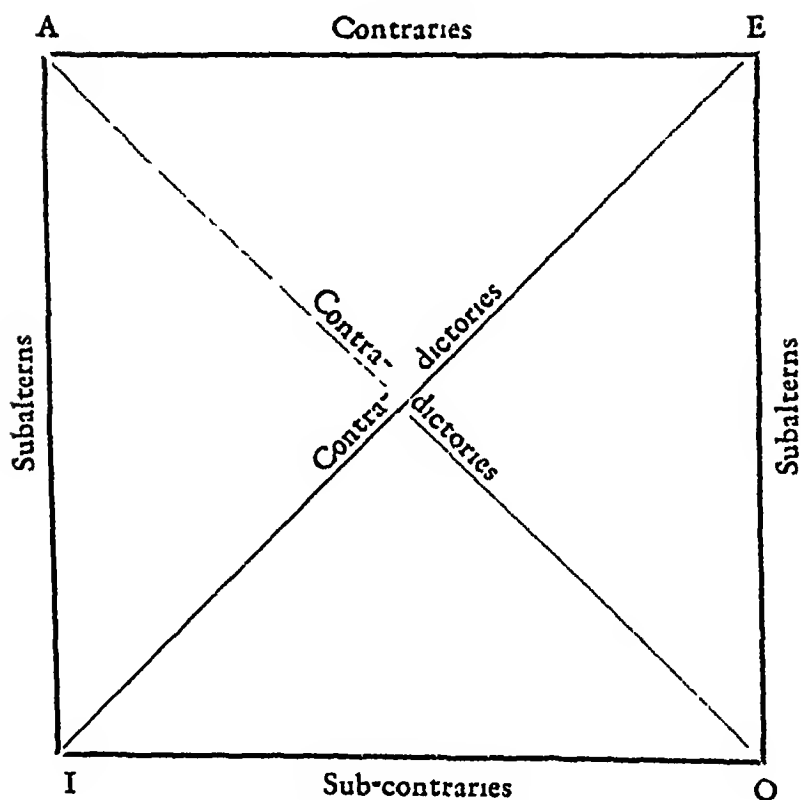
Now we shall explain the meaning and implications of each of these relations.

(1) *The Relation of Subalternation.*—This exists between a universal and a particular proposition of the same quality, viz, between (a) A and I and (b) E and O

Both the propositions so related are called *subalterns*

Of the two, the universal proposition is called *the sub-alternant* or *subalternans,* and the particular the *subalternate* or *subaltern.*

The mutual relation of the subalterns. From the truth of the universal proposition follows the truth of the particular. *That is to say, from the truth of A follows the truth of I, and from that of E follows the truth of O.*

From	All S is P (A)
	follows
	Some S is P (I)
and *From*	No S is P (E)
	follows
	Some S is not P (O)
From	All men are mortal (A)
	follows
	Some men are mortal (I)
and *From*	No man is infallible
	follows
	Some men are not infallible;

but *not vice-versa,* that is, from the truth of I does not follow the truth of A, nor does from the truth of O follow the truth of E. If I and O are true, A and E are doubtful; they may or may not be true.

On the other hand, if I be false, A must also be false; and if O be false, E must also be false; but not *vice versa.* In other words, *from the falsity of the particular follows the falsity of the universal, but not vice versa.* If the universal

is false, the particular may or may not be false   From the falsity of 'Some S is P' follows the falsity of 'All S is P', and from the falsity of 'Some S is not P' follows the falsity of 'No S is P', but not *vice versa*

To sum up, in the relation of subalternation

(*a*) From the truth of the universal follows that of the particular, but not *vice versa*

(*b*) From the falsity of the particular follows that of the universal, but not *vice versa*

(*n*) *The Relation of Contradiction* —This exists between The universal affirmative and the particular negative, and (*b*) the universal negative and the particular affirmative, between A and O, and E and I, that is to say, between two propositions differing both in quality and   quantity   The two propositions thus related are called *contradictories*

The mutual relation of the contradictories.   Of two contradictories if one be true, the other must be false, and *vice versa, if one be false, the other must be true* By *the Principle of Contradiction* both the propositions cannot be true together, and by *the Principle of Excluded Middle* both cannot be false   Thus from the truth of A and E follows the falsity of O and I respectively, and from the falsity of A and E, the truth of O and I respectively, and *vice versa* *

(*m*) *The Relation of Contrariety* —This exists between the universal affirmative and the universal negative proposi-

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* The students ought to frame propositions in the form of S—P and see the truth of these statements

tions,—between A and E.   A & E are called *contraries* in relation to each other.

Of two contraries, if one be true, the other is false, but not vice versa, that is, if one is false the other may or may not be true.   From the truth of A follows the falsity of E; and from the truth of E, the falsity of A.   But from the falsity of A or E does not follow the truth of E or A.

(iv) The Relation of Sub-Contrariety.—This exists between the particular affirmative and the particular negative propositions; between I and O.

The propositions so related are called *sub-contraries,* for in the relation between I and O perfect contrariety is absent, and so far the falsity of one does involve the truth of the other, but not *vice versa.*

If 'Some S is P' (I) is false its contradictory E, according to the Principle of Contradiction, is true, and therefore, by subalternation, O is also true.   Similarly if 'Some S is not P' (O) is false, its sub-contrary I is also true.   But from the truth of I or O we cannot infer the falsity of O or I, for both 'Some S is P' (I), and 'Some S is not P' (O) may be true together.

3.   THE TABLE OF THE RELATIONS OF OPPOSITION

The following is a table of the various mutual relations of A, E, I and O according to the Opposition of Propositions.   The name of opposition is mentioned within brackets·—

THE TABLE OF OPPOSITION

Given	A	O	E	I
A as true	True	False (contradictory)	False (contrary)	True (subaltern)
A as false	False	True (contradictory)	Doubtful (contrary)	Doubtful (subaltern)
E as true	False (contrary)	True (subaltern)	True	False (contradictory)
E as false	Doubtful (contrary)	Doubtful (subaltern)	False	True (contradictory)
I as true	Doubtful (subalternant)	Doubtful (sub-contrary)	False (contradictory)	True
I as false	False (subalternant)	True (sub-contrary)	True (contradictory)	False
O as true	False (contradictory)	True	Doubtful (subalternant)	Doubtful (sub-contrary)
O as false	True (contradictory)	False	False (subalternant)	True (sub-contrary)

4   OPPOSITION OF HYPOTHETICAL PROPOSITIONS

"Opposition applies equally well to those more definite judgments of connexion of content which are expressed in hypothetical form.   The true hypotheticals: 'If S is M, it is P, and If S is M, it is not P,'—or expressed in the more general but less definite symbolism· If A then X, and if A then not X—are universals, and correspond to the A and E categorical forms respectively; while the particulars. If S is M, it may be P, and If S is M, it need not be P,—or in the wider symbolic form, If A then perhaps X, and if A then not necessarily X—correspond to the I and O categorical forms   Having thus all the four necessary forms the whole doctrine of opposition is applicable "[1]

5.   OPPOSITION OF DISJUNCTIVE PROPOSITIONS

"The most general symbolic form of the disjunctive proposition—Either X or Y—is most suitable to those cases in which the alternative judgments have not the same subject. A disjunctive proposition in this form must be regarded as singular, and as, consequently, only capable of contradiction. The contradictory proposition is *Neither* X *nor* Y, and this is not itself a disjunctive judgment

But the more perfectly stated disjunctive judgments, in which several predicates are alternatively affirmed of the same subject, admit of distinctions of quantity, and propositions of opposite quality can be found which stand to them in the relation of contradiction and contrariety   Thus with the

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[1] *Intermediate Logic*, pp 136, 137

judgment of content, S *is either* P or Q, the square of proposition can be completed by the propositions S *is neither* P *nor* Q (Contrary); S *may be either* P or Q (contradictory). These distinctions, as in the case of categorical judgments, stand out yet more clearly in the denotative forms of the propositions. Here we have the universal affirmative—*Every* S *is either* P *or* Q, the universal negative *No* S *is either* P *or* Q; the particular affirmative—*Some* S's *are either* P *or* Q; and the particular negative *Some* S's *are neither* P *nor* Q. But it will be noticed that none of the negative forms are disjunctive propositions S *is neither* P *nor* Q is equally well expressed in the copulative categorical form S *is both non-P and non-Q;* and similar propositions express the negative denotative forms. Hence, the full doctrine of opposition cannot be said to be applicable to disjunctive propositions."

"As a concrete example we may take the proposition '*Every swan is either white or black*' Its *subaltern* is '*Some swans are either white or black*'; its *contradictory* '*Some swans are neither white nor black*', and its *contrary* '*No swan is either white or black*.'"[1]

HINTS AND EXAMPLES

1   Learn the names of the various relations of opposition, and the symbolic names of propositions between which they exist

2   Keep well in mind the implications of these mutual relations with regard to the truth or falsity of propositions

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[1] *Intermediate Logic,* pp 137, 138

11

3. State these implications as they are indicated in the table of *opposition, or, in the case of concrete examples, express these by means of concrete forms of* propositions

For Example,

(a) 'All men are mortal'—(A) *being true,*

'Some men are mortal'—(I) is *true* (being the subalternate).

'No man is mortal'—(E) is *false* (being contrary)

'Some men are not mortal'—(O) is *false* (being contradictory).

(b) 'Some men are wise'—(I) *being false,*

'All men are wise'—(A) is *false* (subalternant).

'No man is wise'—(E) is *true* (contradictory).

'Some men are not wise'—(O) is *true,* (sub-contrary).

QUESTIONS AND EXERCISES

1   Select from the following propositions any one pair of contrary, contradictory, subaltern and sub-contrary judgments.—

(a) Some elements are known

(b) No elements are known

(c) All elements are known

(d) Some elements are not known

(e) Elements are all the things we know

(f) Some elements are all the things we know

What are the immediate inferences that can be drawn from the contradictory opposition of two judgments?   (A U, 1893)

2   What is Opposition?   Show by means of the sub-contrary propositions that contrary propositions may both be false   What propositions are true, false or unknown when E is false?   (A U, 1894)

3   What is contradictory opposition?   Why is it   the   most

perfect form of opposition? Are A and O contradictories? Give reasons for your answer   (A U , 1894)

4   What inferences follow by Opposition from the truth of the proposition? 'Some books are not interesting'   (A. U., 1895)

5.   Select out of the following oppositions as many pairs of contrary, contradictory, subaltern and sub-contrary propositions as you can —

(a) No facts are available.

(b) Few of the facts are available.

(c) Some of the facts are not available.

(d) All the facts are available.

(e) Some facts are available.

(f) A few facts are available.

(g) Most of the facts are not available

(h) Not all the facts are available

(i) All the facts are not available   (A. U., 1896).

6   What is meant by the Opposition of Propositions? Give all the logical opposites of —

(a) Mr Gladstone is a great statesman.

(b) If this statement is not true, you are mistaken

(c) Every swan is either white or black   (A U , 1897)

7   What is meant by Logical Opposition? Carefully distinguish contrary and contradictory opposition   Why is it desirable in controversy to refute a statement by its contradictory rather than its contrary?   Give the contradictory of each of the following propositions —

(a) Few distinguished men have had distinguished sons

(b) Two-thirds of the candidates passed

(c) Macaulay is always clear   (A U , 1898)

8   What is meant by the Opposition of Propositions? Explain all that is implied in the Square of Opposition

9. Explain the common table of Opposition of Propositions. Classify the following propositions according to quantity and quality:—

It is only the bold who are lucky.

Those who escape are very few.

No one is admitted except on business.

It cannot be that none will fail.   (Questions on Logic)

10. On the common view of the Opposition of Propositions, what are the inferences to be drawn from (a) the truth, and (b) the falsity, of each of the four categorical propositions? (Questions on Logic).

11. 'All men are religious'—granting the falsity of this proposition, what can you infer as to the truth or falsity of the remaining propositions in the Square of Opposition?

12. Assuming the proposition "Some good thinkers are not good speakers" to be true, what can you infer with regard to the truth or falsity of each of the following.—

(a) All good thinkers are good speakers.

(b) Some good thinkers are good speakers

(c) No good thinker is a good speaker.

Give reasons.

PART IV
INFERENCE

CHAPTER I

IMMEDIATE INFERENCE

1 THE NATURE AND KINDS OF INFERENCE

It has been said that a judgment is the unit of thought. In a judgment we assert the relation of agreement or disagreement between two concepts which form the subject and the predicate   So in a judgment we are concerned with concepts   *Now when from what is said in one or more judgments we try to arrive at some other judgment, or judgments, which makes explicit some truth that may have been implicit in the original judgment, or judgments, the process as well as the product of this kind of mental activity is called inference*   Every inference must be the process and product of *a real movement* of thought from a known truth to another which is not obvious at first   It must be noted that no inference is altogether new, or totally different from the original judgment or judgments

As pointed out already inference has been distinguished as (1) *Immediate Inference* and (2) *Mediate Inference*, according as the inference is derived from one   judgment, or from more than one judgment   Then some logicians further distinguish Immediate Inference as (*i*) *The Opposition of Propositions*, and (*ii*) *Eductions*   The first of these has

already been dealt with in the last chapter and the second we shall explain presently. The Opposition of Propositions has not been included in the present chapter, for it has been thought fit not to call it Immediate Inference. For, although in Opposition we speak of inferring the truth or falsity of other propositions from the truth or falsity of a given proposition, there is hardly movement of thought enough to entitle us to call such acts the process and product of inference. They are merely implications of the truth or falsity of a certain proposition, and are too obvious to deserve the name of inference.

2. THE VARIOUS KINDS OF IMMEDIATE INFERENCE

The following are the usual forms of Immediate Inference:—

(i) *Conversion.*
(ii) *Obversion.*
(iii) *Obverted Conversion.*
(iv) *Contraposition.*
(v) *Obverted Contraposition.*
(vi) *Inversion.*
(vii) *Obverted Inversion.*

(i) *Conversion.—Conversion is the eduction of a proposition from another proposition by transposing the subject and the predicate of the original proposition.* The original proposition, that which is converted, is called *the convertend.* The proposition which is obtained from the original proposition by conversion is called *the converse.*

The Rules of Conversion.   They are as follows:—

>   (*a*) The quality of the converse must be the same as that of the convertend.

>   (*b*) No term must be distributed in the converse which is not distributed in the convertend.

Now we shall deal with the conversion of each of the four kinds of propositions A, E, I, and O.

Conversion of A—The form is '*All S is P* '   Now in converting this—

>   (*a*) P, the predicate, becomes the subject.
>   (*b*) S, the subject, becomes the predicate
>   (*c*) The quality remains the same, i e , affirmative [Rule (*a*)]
>   (*d*) The quantity has to be changed, that is to say, the proposition becomes particular, for in 'All S is P,' P as the predicate of an affirmative proposition is undistributed, and so it cannot be distributed as subject of the converse [Rule (*b*)]. In other words, the proposition is to be particular.

This process gives us the converse—'Some P is S'—an I proposition.

So the converse of A is I,—'S *a* P' *is converted   into* 'P *i* S'

A concrete example —

Convertend—All men are mortal

Converse—Some mortal beings are men

It must be noted, however, that the quantity will not change in converting an A proposition, the subject and the predicate of which are identical, or which exactly coincide with each other, e.g , 'These boys are all the students of the First Year Class,' has for its converse· 'All the students of the First Year Class are these boys'.   The reason for not changing the quantity here is obvious, for the predicate 'all the students of the First Year Class' is distributed in the original proposition, and so it can be distributed when it forms the subject of the converse.

Conversion of E—The form is *'No S is P'*.   Now in converting this, like A, the predicate becomes the subject, the subject becomes the predicate, and the quality remains the same, and, unlike A, the quantity also remains unchanged

So the converse of 'No S is P' (E) is 'No P is S' (E)· That is to say, the converse of E is E;—'S e P' is converted into 'P e S'.

Concrete example:—
Convertend—No man is immortal
Converse—No immortal (being) is man

In E the quantity of the converse can be the same as that of the convertend, for the predicate in the original proposition is distributed, and so it can be distributed also in the converse of which it forms the subject.   In other words, the converse is also a universal proposition.

Conversion of I—The form is *'Some S is P '*
In the converse P becomes the subject and S the predi-

cate, and the quality and quantity remain unchanged   So the converse of 'Some S is P' is 'Some P is S'—I

The converse of I is I,—'S *i* P' is converted into 'P *i* S'.

Concrete example·—

Convertend—Some men are wise

Converse—Some wise beings are men

O cannot be converted—The form of O is '*Some S is not P*'   Now if we transpose the subject and the predicate and the quality of the proposition remains unchanged, we get 'Some P is not S'.   But 'S' in this proposition, being the predicate of a negative proposition is distributed, while it is not distributed in the original proposition, being the subject of a particular proposition, and so the second rule of conversion is violated   This shows that O cannot be converted.

Recapitulation

(1) The converse of A is I,—of 'S *a* P' is 'P *i* S'

(2)   „   „   „ E is E,—of 'S *e* P' is 'P *e* S'

(3)   „   „   „ I is I,—of 'S *i* P' is 'P *i* S '

(4)   O has no converse

The conversion of A into I, where the convertend is universal, and the converse particular, is called *Conversion per accidens, or by limitation.*

The conversion of E and I, where the convertend and the converse are of the same quality and quantity, is called *Simple Conversion*

EXERCISES ON CONVERSION

NOTE.—In all cases of inference a statement is to be put first into its strict
logical form, and then only to be dealt with according to the rules
of the particular kind of inference.

Convert the following propositions·—

1. Paris is the most beautiful city in the world.
2. All men are not learned.
3. Few men know both science and literature.
4. All that glitters is not gold.
5. Every man is not to be trusted
6. None is perfect except God.
7. Virtuous deeds alone are praiseworthy.
8. Spare the rod and spoil the child
9. A man is either rational or irrational.
10 Columbus discovered America.
11. Knowledge is power
12. Logic is a science.
13. Some men are learned
14. No European is black.
15 Only graduates need apply for the post.

(ii) *Obversion.—Obversion, also called Permutation or Aequi-
pollence, is the process of taking the contradictory of the predicate
of the original proposition as the predicate of the inference, and
changing the quality of the proposition.*

The proposition which is obverted is called *the obvertend*.

The proposition which is obtained by the process of obversion
is called the *obverse*.

The Rules of Obversion —These follow from the definition, and
are as follows·—

(a) Take the contradictory of the predicate of the obvertend as the predicate, and the subject as the subject of the obverse

(b) Change the quality, but not the quantity of the obvertend

Now following the above rules we get the obverse of A, E, I and O as follows   The contradictory of a certain   symbol   is   expressed by putting a dash on the top of it, e g , the contradictory of P is to be expressed by $\overline{P}$, of S by $\overline{S}$, and so on

Obversion of A,   S *a* P, All S is P

  S *e* P, No S is non-P

Concrete example—

*Obvertend—*All Europeans are white

*Obverse—*No Europeans are not-white, (E)

So the obverse of A is E

Obversion of E

Obvertend—S *e* P, No S is P

Obverse—S *a* P, All S is not-P

Concrete example—

*Obvertend—*No man is divine

*Obverse—*All men are not-divine, (A)

So the obverse of E is A

Obversion of I.

*Obvertend—*S *i* P, Some S is P

*Obverse—*S *o* P, Some S is not not-P

Concrete example—

*Obvertend—*Some men are religious

*Obverse—*Some men are not not-religious, (O)

So the obverse of I is O.

Obversion of O.

Obvertend—S o P, Some S is not P.

Obverse—S i P, Some S is not-P.

Concrete Example—

Obvertend—Some men are not clever.

Obverse—Some men are not-clever, (I)

So the obverse of O is I.

Recapitulation.—

The obverse of A is E, of S *a* P is S *e* $\overline{\overline{P}}$.

„   „   „ E is A, of S *e* P is S *a* $\overline{\overline{P}}$.

„   „   „ I is O; of S *i* P is S o $\overline{\overline{P}}$

„   „   „ O is I, of S o P is S *i* $\overline{P}$.

EXERCISES ON OBVERSION

NOTE —The exercises given in the previous section may also be used for obversion
in addition to the following ones —

Obvert the following —

(1) Not all the Bhils are robbers

(2) Honesty is the best policy

(3) Only the brave deserve the fair

(4) Fixed stars are luminous.

(5) War is a great evil, and also a great good

(6) The slow and steady wins the race.

(7) A bird in the hand is worth two in the bush

(8) Great are the advantages of free trade

(9) Uneasy lies the head that wears a crown

(10) A penny saved is a penny gained.

(11) Not all the students are dull

(12) Some men are very clever

(*iii*) *Obverted Conversion* —*Obverted Conversion is the process of first converting a proposition and then taking the obverse of the converse* according to the rules of conversion and obversion.

Thus the obverted converse of A, E and I is as follows —

I—(1) A (original proposition) S *a* P—All S is P

 (2) Converse of the above—P *i* S—Some P is S

 (3) Obverted Converse of (1)

  (obverse of 2)—P *o* $\overline{\text{S}}$—Some P is not not-S

II—(1) E (original proposition) S *e* P—No S is P

 (2) Converse of (1)—P *e* S—No P is S

 (3) Obverted Converse

  (obverse of 2)—P *a* $\overline{\text{S}}$—All P is not-S

III—(1) I (original proposition) S *i* P—Some S is P

 (2) Converse of (1)—P *i* S—Some P is S

 (3) Obverted Converse

  (obverse of 2)—P *o* $\overline{\text{S}}$—Some P is not not-S

There is no obverted converse of O, for O cannot be converted, and consequently there cannot be any obverted converse

For exercises get the obverted converse of propositions given on p 172

(*iv*) *Contraposition* —*Contraposition is the process of taking the contradictory of the original predicate as the subject, and the subject as the predicate of the inference, and then changing the quality, or both the quality and quantity of the proposition, if required*

The proposition obtained by the process of contraposition is called *the contrapositive*

Contraposition is really a compound process of immediate inference obtained by (1) *Obversion,* and (2) *Conversion,* of the original proposition.

I—(1) A (original proposition)—S *a* P; All S is P

(2) Obverse of (1)   S *e* $\overline{P}$; No S is not-P.

(3) (Converse of 2) and

Contrapositive of (1) $\overline{P}$ *e* S; No not-P is S.

II—(1) E—(original)—S *e* P—No S is P.

(2) Obverse of (1)—S *a* $\overline{P}$—All S is not-P.

(3) (Converse of 2) and

Contrapositive of (1)—$\overline{\overline{P}}$ *ı* S—Some not-P is S.

III—*There is no contrapositive of I,* for when it is obverted it yields an O proposition, and then O cannot be converted.

IV—(1) O—(original)—S *o* P; Some S is not P.

(2) Obverse of (1)—S *ı* $\overline{P}$; Some S is not-P.

(3) (Converse of 2) and

Contrapositive of (1)—$\overline{P}$ *ı* S; Some not-P is S.

The process of contraposition is also sometimes called *conversion by Negation.*

For exercises contrapose propositions given for obversion on p. 174.

(*v*) *Obverted Contraposition.—Obverted contraposition is the process of obverting the contraposition of a proposition*

The inference thus obtained is called the obverted contrapositive. The processes involved in the inference are as follows —

(1) Obversion   ⎫
(2) Conversion   ⎬ Contraposition
(3) Obversion   ⎭

So the obverted contrapositive of propositions is as follows —

Original Proposition	Obverted Contrapositive
(1) A—S a P	A—$\overline{P}$ a $\overline{S}$
(2) E—S e P	O—$\overline{P}$ o $\overline{S}$
(3) I—S i P	Nil
(4) O—S o P	O—$\overline{P}$ o $\overline{S}$

There is no obverted contrapositive of I, for it has no contrapositive

The student, as an exercise, should see for himself how the obverted contrapositive is obtained by the three processes of obversion, conversion and obversion

Any of the propositions already given on pp 172 and 174 may be used for exercise

(vi)—Inversion—Inversion is the process of taking the contradictory of the subject of the given proposition as the subject, and the predicate as the predicate, of the inverse, and changing the quality and quantity of the proposition

The proposition inverted is called the *Invertend*

The proposition obtained by inversion is called the *Inverse*

It is found that only A and E propositions can be inverted The first two processes that we have to employ for inversion are either (1) conversion and obversion, or (2) obversion and conversion Now in the case of an I proposition we start with S i P, and by conversion and obversion we get the following —

(1) Original Proposition S i P
(2) Converse of (1)   P i S
(3) Obverse of (2) P o $\overline{S}$

12

Now in order to get the contradictory of S, the subject of the original proposition, as the subject of inference, we require one more step of conversion   But (3) being an O proposition cannot be converted, and so we cannot proceed any further   Following the order of obversion and conversion it is plain that by obverting an I proposition we get an O, which cannot be converted, and so we cannot proceed any further.

Similarly in the case of an O proposition, if we start with conversion, even the first step is not possible, for O cannot be converted.   On the other hand, if we start with obversion, we get the following series:—

    (1) Original Proposition—S o P
    (2) Obverse of (1)   S i $\bar{P}$
    (3) Converse of (2) $\bar{P}$ i S
    (4) Obverse of (3) $\bar{P}$ o $\bar{S}$

Now in order to make $\bar{S}$, the predicate of (4), the subject we require one more step of conversion.   But (4) being an O proposition cannot be converted, and so we cannot get the inverse of an O proposition.

Inversion of A involves the following processes.—

    (1) Original proposition: S a P
    (2) Obverse of (1) S e $\bar{P}$
    (3) Converse of (2) $\bar{P}$ e S
    (4) Obverse of (3) $\bar{P}$ a $\bar{S}$
    (5) Converse of (4) $\bar{S}$ i $\bar{P}$
    (6) Obverse of (5)

and Inverse of (1) $\overline{S}$ o P

So *the Inverse of S a P is* $\overline{S}$ o P

Inversion of E involves the following processes —

(1) Original Proposition S e P
(2) Converse of (1)   P e S
(3) Obverse of (2)   P a $\overline{S}$
(4) Converse of (3)
    and inverse of (1) $\overline{S}$ i P

So *the Inverse of S e P is* $\overline{S}$ i P

(*vii*) *Obverted Inversion* —*Obverted Inversion is the process of taking the obverse of the inverse of a proposition.*

As only A and E have an inverse, the obverted inverse also is possible only in the case of these forms.

The Obverted Inverse of A

(1) Inverse of A is $\overline{S}$ o p
(2) Obverted inverse of A is $\overline{S}$ i $\overline{P}$

The Obverted Inverse of E

(1) Inverse of E is $\overline{S}$ i P
(2) Obverted inverse of E is $\overline{S}$ o $\overline{P}$

EXERCISES

Give the Inverse and the Obverted Inverse of the following —

(1) Kings are divine
(2) Monarchy is the worst form of Government.
(3) No one without a ticket is allowed to travel

    (4) Some who fear are overtaken by death.

    (5) Not all who try succeed.

    (6) The fewer the merrier.

    (7) Two and two make four

    (8) Blessed are those who love the name of the Lord.

    (9) They who sin shall weep.

  (10) No man is infallible

  (11) No monarch is without some pride

  (12) Happy are the contented.

3   THE TABLE OF EDUCTIONS

The various forms of Eduction explained above may be tabulated as follows —

		A	E	I	O
	Original Proposition	$S\,a\,P$	$S\,e\,P$	$S\,i\,P$	$S\,o\,P$
(i)	Converse	$P\,i\,S$	$P\,e\,S$	$P\,i\,S$	
(ii)	Obverse	$S\,e\,\overline{P}$	$S\,a\,\overline{P}$	$S\,o\,\overline{P}$	$S\,i\,\overline{P}$
(iii)	Obverted Converse	$P\,o\,\overline{S}$	$P\,a\,\overline{S}$	$P\,o\,\overline{S}$	
(iv)	Contrapositive (converted obverse)	$\overline{P}\,e\,S$	$\overline{P}\,i\,S$		$P\,i\,S$
(v)	Obverted Contrapositive (obverse, converse, and obverse)	$\overline{P}\,a\,\overline{S}$	$\overline{P}\,o\,\overline{S}$		$\overline{P}\,o\,S$
(vi)	Inverse	$\overline{S}\,o\,P$	$\overline{S}\,i\,P$		
(vii)	Obverted Inverse	$\overline{S}\,i\,\overline{P}$	$\overline{S}\,o\,\overline{P}$		

4.   EDUCTION OF HYPOTHETICAL PROPOSITIONS

Although true hypothetical propositions are universal, yet if we make distinctions of A, E, I and O among them, they admit of all kinds of education.   The strict logical form of hypothetical propositions, in which they are to be expressed, before inferences are drawn from them, are as follows.—

A—If any S is M, then always, that S is P.
E—If any S is M, then never, that S is P
I—If any S is M, then sometimes, that S is P
O—If any S is M, then sometimes not, that S is P.

We can substitute, the words 'in all cases' for 'always'; 'in no case' for 'never'; 'in some cases' for 'sometimes'; and 'in some cases not' for 'sometimes not' in the above forms.

As an example we give all the eductions of a hypothetical proposition

(1) *Original—A, If any S is M, then always, that S is P.*

(2) *Converse—I, If any S is P, then sometimes, that S is M*

(3) *Obverse—E, If any S is M, then never, that S is not P.*

(4) *Obv Converse—O, If any S is P, then sometimes not, that S is not M.*

(5) *Contrapositive—E, If any S is not P, then never, that S is M*

(6) *Obv. Contrapositive—A, If any S is not P, then always, that S is not M.*

(7) *Inverse*—O, If any S *is not* M, *then sometimes not,* that S *is* P

(8) *Obv Inverse*—I, If any S *is not* M, *then sometimes, that* S *is not* P

For exercise the student may, in the same way, draw inferences from E, I and O hypothetical propositions.

5   EDUCTION OF DISJUNCTIVE PROPOSITIONS

"Eductions can only be drawn from disjunctive propositions in which alternative predicates are affirmed of one subject   They are more clearly seen if we take the denotative forms of proposition, corresponding to the categorical A and I, and the same eductions can be drawn from the former as from the latter   The derived propositions, however, are not themselves disjunctive

The symbolic expressions of the eductions from a universal disjunctive are —

{   (1) *Original Proposition*—Every S *is either* P *or* Q.
    (2) *Obverse*—No S *is both* $\bar{P}$ *and* $\bar{Q}$

{   (3) *Converse*—Some things that are either P or Q are S
    (4) *Obverted Converse*—Some things that are either P or Q are not $\bar{S}$

{   (5) *Contrapositive*—Nothing that is both $\bar{P}$ and $\bar{Q}$ is S
    (6) *Obverted Contrapositive*—Everything that is both $\bar{P}$ and $\bar{Q}$ is $\bar{S}$

    (7) *Inverse*—Some $\bar{S}$'s are neither P nor Q
    (8) *Obverted Inverse*—Some $\bar{S}$'s are both $\bar{P}$ and $\bar{Q}$ "[1]

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[1] *Intermediate Logic*, p 155

6.   A Few other kinds of Eductions

We may note a few other kinds of eductions which are of infrequent occurrence and not important. They can hardly be called inference.

(*i*) *Immediate Inference by Added Determinants.*—This process consists in adding the same determinant or adjective to the subject and the predicate of the original proposition.

For example

If S is P.

Then AS is AP.

If angels are supernatural beings,
Then good angels are good supernatural beings.

But this process does not yield valid conclusion in all the cases of added determinants.   For example, in the following two instances given by Jevons the process does not yield a correct conclusion·—

(1)   All kings are men.
   All incompetent kings are incompetent men.

(2)   A cottage is a building.
.   A huge cottage is a huge building

The reason why the arguments, such as given above, are not correct is that the determinant which is meant to specify the subject only is added to the whole of the predicate, the class denoted by which may be wider than that denoted by the subject.

(*ii*) *Immediate Inference by Complex Conception.*—

This consists in employing the subject and the predicate of the original proposition as parts of a more complex conception

For example

Man is a rational being

     The actions of a man are the actions of a rational being

But this process too, like the previous one, does not apply to all such reasonings   For instance, to borrow an example from Mellone, we cannot argue as follows.—

If all Protestants are Christians,

Then, a majority of Protestants are a majority of Christians

(iii) Immediate Inference by Converse Relation —This is, according to Dr Keynes, a process by which, from a statement of the relation in which S stands to P, we pass to a statement of the relation in which P consequently stands to S

For example

(1) S is greater than P,

     P is less than S

A right angle is greater than an acute angle,

     An acute angle is less than a right angle

(2) S is older than P,

     P is younger than S

Rama is older than Govinda,

     Govinda is younger than Rama

(3) S *is the husband of* P,

∴   P *is the wife of* S.

John *is the husband of Mary,*

∴   *Mary is the wife of John.*

The process consists of transposing the terms of the original proposition and replacing the word by which their relation is expressed by its correlative.

HINTS AND EXAMPLES

1.   Remember well the rules and the processes of conversion and obversion, for it is upon these that the rest of the compound eductions are based.

2.   Put the grammatical sentence always into its strict logical form in order to obtain eductions.

3.   Other eductions besides the converse and the obverse are to be arrived at by either (*a*) making necessary changes in the form and the position of the subject and the predicate, and changing the quality or quantity, or both of them, as required by the rules, or (*b*) by doing conversion and obversion according to a fixed order and number in the series.

Take for an example, the sentence   'No coward deserves the prize,' and let us obtain the inverse of it.

Original Sentence—No coward deserves the prize.

Logical Form—No coward is one who deserves the prize.

Now following the rule of inversion we take the contradictory of the subject as subject of the inverse, and change the quality and quantity of the proposition, the contradictory of 'coward' is 'not-coward,' and by changing the quality and quantity of E we get I So the inverse is: 'Some not-cowards are those who deserve the prize' (I)

Now this inference we can test by the other indirect method of conversion, obversion, etc , as follows —

(1) *Orig proposition   No coward is one who deserves the prize,* (E)

(2) *Converse of* (1)   *None who deserves the prize is a coward,* (E)

(3) *Obverse of* (2)   *All who deserve the prize are not-cowards,* (A)

(4) *Converse of* (3) *and Inverse of* (1)   *Some not-cowards are those who deserve the prize,* (I)

So we see that the conclusion arrived at by this indirect method is the same as that got by the direct one

Similarly we can obtain other kinds of compound eductions by any of the two methods   The student need not apply both the methods except when he wants to test the conclusion obtained by one by means of the other

QUESTIONS AND EXERCISES

1   Define Obversion or *Permutation*   Draw inferences by obversion from the following

(*a*) All X is Y

(*b*) No men are gods

(*c*) Some books are interesting

(*d*) Some men are not wise   (A U, 1895)

2   Assign the logical relation (if any) between each pair of the following propositions taken two and two together (i e , 15 pairs), and show by what processes of immediate inference we may pass from one to the other —

(*a*) All good men are happy

(*b*) Some happy men are not good

(*c*) Some men who are not good are not happy

(*d*) No good men are unhappy

(*e*) Some happy men are good men

(*f*) All happy men are good men   (A U, 1896)

(a) All poets have known great sorrow.

(b) Some professional men are dishonest.

(c) If the powder becomes wet, the gun is rendered useless.   (A. U, 1910).

16.   Draw as many inferences as you can from the following propositions, giving in each case the logical name of the kinds of inference:—

(a) Some men of great imaginative power are not poetical.

(b) If a man is honest he is trusted.   (A. U., 1911).

17.   (a) Infer as many propositions as you can from:

(i) No man is mortal.

(ii) Ice is cold.

(b) What is the logical relation between the proposition (i) Only graduates are eligible, and (ii) Some graduates are eligible? (A U, 1913)

18.   What is inference?   Is there any inference in the Opposition or Conversion of Propositions?

Put into logical form and give the contrapositive, contrary and contradictory of —

(a) A man may smile and be a villain

(b) No news is good news

(c) What cat's averse to fish?

(d) Not every case of plague is incurable.

(e) Our remedies oft in ourselves do lie.

That we ascribe to heaven   (A. U, 1914)

19.   Draw all the conclusions you can by the various forms of immediate inference which are applicable from

(a) All is not gold that glitters

(b) Silver is heavy. (A. U., 1915).

20. Put into strict logical form and convert, naming the kind of conversion applied in each case.—

(a) There is no fool like an old fool

(b) None but the residents of the United Provinces are eligible

(c) Slow and steady wins the race

(d) Only the actions of the just.
Smell sweet and blossom in the dust.

(e) A fool and his money are soon parted

(f) Few criminals thrive.   (A U, 1915)

21   What do you understand by immediate inference? Note briefly the most common forms, and the converse, obverse and contrapositive of 'All cows are ruminants'   (A U, 1916)

22   Put the following propositions into strict logical form convert (a) and (b), obvert (c), and give the contrapositive of (d) —

(a) Only imaginative men can be great statesmen

(b) Most stamps are perforated.

(c) All magistrates are not sympathetic

(d) The ox chews the cud   [A U, 1917].

23   Give the converse, obverse and contrapositive of —

(a) None but graduates are eligible

(b) Most snakes are not poisonous   [A U, 1918]

24.   What immediate inferences may be drawn from the proposition   'No great scientist is without imagination?' Name the process in each case   [A U, 1919]

25   Reduce the following proposition to logical form and give its converse, obverse, contrapositive, contrary and inverse

'There is no possibility of serious opposition to such a proposal [A U, 1920]

26   What is the nature of immediate inference? Give the contrary, contradictory, converse, obverse and contrapositive of "No illogical author is truly scientific"   [A U, 1922]

27. Transform the following propositions in such a way that they have S as subject and P as predicate:

(*i*) No non-P is S.

(*ii*) All P is non-S

(*iii*) Some non-P is not non-S

Name the processes involved in the transformation and verify your results by means of Euler's circles.   (U. I. B, 1924)

28 It is maintained that all inference ultimately rests on the Laws of Thought Examine this statement with reference to the following inferences —

(*i*) All S is P, ∴. No S is non-P

(*ii*) No S is P, ∴ All S is non-P.   (U. I B, 1930)

29. If we know that parallel straight lines never meet, what can we infer (*a*) about lines which do not meet, and (*b*) about lines which are not parallel? Describe carefully the process of argument used in each case   (N. U, 1930)

30   (*a*) Can any *inference be immediate?*

(*b*) Give (1) the logical form, (2) converse, and (3) contrapositive of the following·—

(*a*) A few distinguished men have had undistinguished sons

(*b*) Many a flower is born to blush unseen   (N U, 1931)

CHAPTER II

MEDIATE INFERENCE

Syllogism

1   DEFINITION AND PARTS OF SYLLOGISM

*A syllogism may be defined as a form of mediate infer-
ence, in which, from two propositions having a common
element, we derive a third proposition which follows from
them as a necessary consequence*

In the previous chapter we dealt with the various forms
of immediate inference, which, we saw, all of them involved
inference from one proposition only   Here in the present
chapter we have to deal with inference which is derived from
two propositions   But any two propositions would not yield
an inference   For example, the following two propositions
can be put together but they cannot yield any inference —

    (*i*) All men are mortal

    (*ii*) All birds have feathers

The reason is that these propositions are totally uncon-
nected   There is no common element which might form the
basis of inference   On the other hand, the following pro-
positions with a common element—a common term—can
yield an inference —

    All birds are feathered,

13

All kites are birds,

∴ All kites are feathered.

Here the first two propositions are connected together by the reason of having a common term 'birds', and therefore, all the other conditions of mediate inference being fulfilled, we get as inference a third proposition 'All kites are feathered.'

Parts of a Syllogism

The two propositions from which an inference is drawn are called *the Premises.*

The proposition which is derived from the premises as an inference is called *the Conclusion.*

The term which stands as the subject of the conclusion is called *the Minor Term.*

The term which stands as the predicate of the conclusion is called *the Major Term.*

The term which is common to both the premises is called *the Middle Term.*

The premise which contains the major term is called *the Major Premise.*

The premise which contains the minor term is called *the Minor Premise*

Symbolically, the minor term, which is the subject of the conclusion, is represented by S, the major term, the predicate of the conclusion, by P; and the middle term, which is common to both the premises, by M. So the symbolical form of a syllogism is as follows·——

$$M-P,$$
$$S-M,$$
$$\overline{}$$
$$S-P$$

There is a difference of opinion among logicians with regard to the reason why the subject and the predicate of the conclusion are called the minor and the major terms respectively, and the third term common to the premises is called the middle term The usual explanation is that this terminology properly applies to the first mood of the First Figure—*Barbara*, in which the predicate of the conclusion would be normally of greater extension than the subject and the third term, and hence it would be appropriately called the major term The term which forms the subject of the conclusion and that of the minor premise in the First Figure would be normally of less extension than the predicate of the conclusion and that of the minor premise in the First Figure, and hence the name minor term The third term common to the two premises is called the middle term because it forms the connecting link between the other two terms This terminology has been extended to the other figures only for convenience, and is not properly applicable to the arguments in those figures

It will appear, however, that according to Aristotle this terminology was not based upon a merely denotative interpretation of the premises and the conclusion of a syllogism. 'In calling the predicate of the conclusion in a syllogism the *major* term', says Joseph, 'then, Aristotle chose a name which

was appropriate, both when the predicate is related to the subject as attribute to concrete thing, and when it is related to the subject as the more to the less generic. And by the name *major* he wished to indicate not (as is sometimes said) that the predicate denoted the larger class, for he did not think of a predicate as a collection of things, including a smaller collection (denoted by the subject term) within it; he meant, that it was the more comprehensive notion· embracing as it were all the subjects of which it could be predicated, but as a character in them and not a class in which they were'.

And again, 'the *middle* term takes its name not simply from being a point of connexion between the other two, but from being really an intermediate concept. This it is, however, only in the first figure But that which in the first figure is really a *middle* term between the major and minor serves equally in the others to be the means of establishing that relation between the major and minor which he wishes to prove, and the nomenclature that is fixed by the first figure is extended to them all '[1]

It must be noted that the position of M, P and S, that is to say, of the middle, the major and the minor terms in the premises, might vary in different arguments, and this difference of position gives rise to the distinctions of what have been technically called *the figures of syllogism*. We shall deal with these figures in the next chapter.

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[1] *An Introduction to Logic*, pp 237, 238

We might take a concrete example of syllogism and no-
tice the various parts.

<div align="center">

(M)   (P)

</div>

[*Major Premise*]—*All Europeans are white,*

<div align="center">

(S)   (M)

</div>

[*Minor Premise*]—*All Englishmen are Europeans,*

<div align="center">

(S)   (P)

</div>

[*Conclusion*]—*All Englishmen are white.*

In this argument '*Englishmen*' being the subject of the
conclusion is the *Minor Term* (S), and '*white*' being the pre
dicate of the conclusion is the *Major Term* (P), '*Europeans*'
the term which is common to both the premises is the *Middle
Term* (M)   The first proposition which contains 'white',
the major term, is *the Major Premise*, the second proposition,
which contains 'Englishmen', the minor term, is *the Minor
Premise*   It must also be noted that all the terms occur twice
in the argument

> (*a*) The major term in the major premise and the
>   conclusion
>
> (*b*) The minor term in the minor premise and the
>   conclusion
>
> (*c*) The middle term in the major and the minor
>   premises

Thus the major and the minor terms are both found in
the conclusion, but not the middle term

<div align="center">

2   KINDS OF SYLLOGISM

</div>

We have seen that a syllogism consists of two premises

and a conclusion.   These premises may form   any   of   the
following combinations·

(1) *The Major and the Minor—both categorical.*

(2) *The Major and the Minor—both hypothetical.*

(3) *The Major and the Minor—both disjunctive.*

(4) *The Major-hypothetical, and the Minor—categorical.*

(5) *The Major-disjunctive, and the Minor—categorical.*

(6) *The Major-hypothetical, and the Minor—disjunctive.*

Now the first three of these combinations form the class
of what have been called *Pure Syllogisms*, for they consist of
only one kind of propositions.   The last three combinations
form the class of *Mixed Syllogisms*, for they consist of two
kinds of propositions

The first three are called respectively   (*i*) *Pure Cate-
gorical*, (*ii*) *Pure Hypothetical*, and (*iii*) *Pure Disjunctive.*

The last three are called respectively· (*i*) *Mixed Hypo-
thetical*, (*ii*) *Mixed Disjunctive* and (*iii*) *Dilemmas.*

So we may tabulate these different kinds of syllogisms as
follows,—

Syllogism
- 1   Pure
  - (*a*) Categorical.
  - (*b*) Hypothetical.
  - (*c*) Disjunctive
- 2.   Mixed
  - (*a*) Hypothetical.
  - (*b*) Disjunctive.
  - (*c*) Dilemmas.

The three kinds of mixed Syllogisms have also been
named by some logicians as   (*a*)   Hypothetical-Categorical,
(*b*) Disjunctive-Categorical   and (*c*) Conjunctive-Disjunc-

tive, or Hypothetical-Disjunctive, according to the combinations of premises Now we shall take up each of these kinds of syllogisms and deal with them at length.

3 GENERAL RULES OF CATEGORICAL SYLLOGISM

The following are the rules of categorical syllogism

I. Relating to the nature of syllogism

(*i*) *There must be three, and only three terms in a syllogism.*

(*ii*) *There must be three, and only three propositions in a syllogism.*

II Relating to Quantity

(*iii*) *The middle term must be distributed in one of the premises at least.*

(*iv*) *No term must be distributed in the conclusion which is not distributed in the premises*

III Relating to Quality.

(*v*) *One of the premises must be affirmative*

(*vi*) *If one of the premises is negative, the conclusion must be negative, and* vice versa, *that is, if the conclusion is negative one of the premises must be negative.*

IV Corollaries from the above rules The following are some of the rules which follow from those given above —

(*i*) *From two particular premises nothing can be inferred*

(*ii*) *If one premise is particular, the conclusion must also be particular.*

(*iii*) *If the major premise is particular and the minor premise negative, no conclusion follows.*

Now we shall examine each of these rules and corollaries separately and see how they are found to be true. However, it might be observed with regard to all of them that they follow from Aristotle's *Dictum de omni et nullo*, which means '*whatever is distributively predicated, whether affirmatively or negatively, of any class may be predicated in like manner of anything which can be asserted to belong to that class*' While examining the rules it will be shown how each of them follows from this *dictum*.

The First Rule that there must be three, and only three terms in a syllogism follows from the *Dictum* in so far as it speaks of three and of only three terms. There is the 'whatever is predicated,' which is the major term, the 'class' of which it is predicated, the middle term, and the 'anything asserted belong to that class, the minor term' (*Welton*).

The rule in itself declares the essential nature of a syllogism, and also *requires that no term used in a syllogism should be ambiguous,* for an ambiguous term is really equal to two terms. Thus the rule also forbids the use of an ambiguous middle term, which is the most usual fallacy.

The Second Rule that there must be three, and only three propositions in a syllogism also follows from Aristotle's *Dictum* in so far as three, and only three propositions are con-

templated by it   There is that in which the original predica-
tion is made of the 'class'—the major premise, that, which
declares something 'to belong to that class'—the minor pre-
mise, and that in which the original predication is made of
that "included something"—"the conclusion " (*Welton*).

This rule follows directly from the definition of syllo-
gism and needs no proof.

The Third Rule that the middle term must be dis-
tributed in one of the premises at least.   "The *Dictum* says
the original predication is made of some 'class.' Now this
'class' is, as has just been said, the middle term, which is
directly regarded by the *dictum* as the subject of the major
premise   Thus, the dictum tells us that in the form of the
syllogism the middle term must be distributed in the major
premise "   Generalising this, we get this rule

This rule is necessary, for in order to establish some kind
of relation between the two premises, so that a conclusion
might follow, the common term (which is the middle term)
must be taken in its entire extension at least once   Other-
wise it would not be possible to say whether there is, or there
is not, any relation between the major and the minor terms
by virtue of their common connection with the middle term.
Let us take an example in which the middle term is undistri-
buted in both the premises, and see how it is impossible to
draw a conclusion from them —

   Some men are wise—(*major premise*)
   All Europeans are men—(*minor premise*)

Now representing these diagramatically we see that the premises do not say whether they mean what the first of these figures shows, viz., that a part of the class of Europeans falls within the class of wise beings, or whether

(1)

(2)
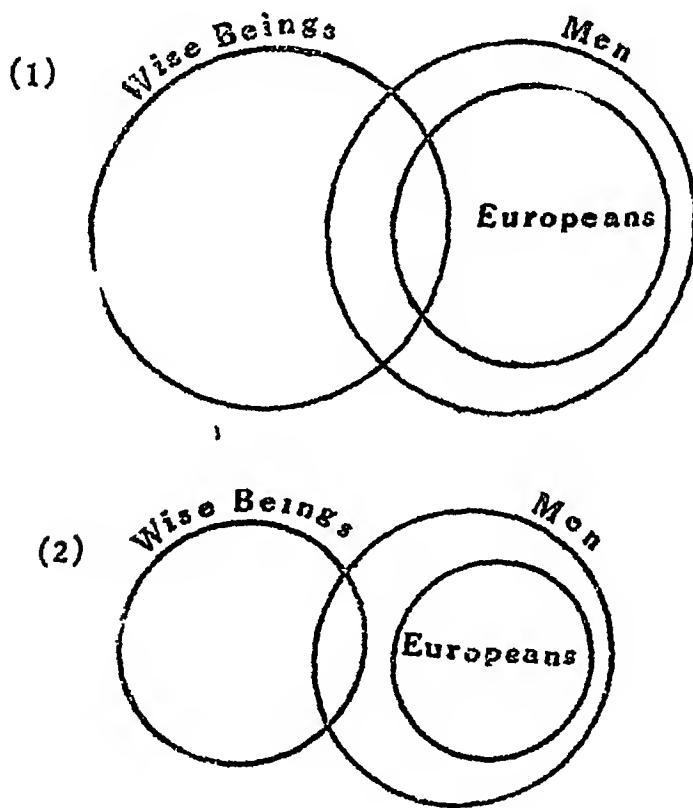
what the second figure shows, viz., that the class of Europeans is completely outside the class of wise beings. In other words, on the basis of these premises we cannot draw any conclusion with regard to the relation between 'Europeans'—the minor term, and 'wise beings'—the major term.

The violation of this rule is called *the Fallacy of Undistributed Middle*

The Fourth Rule that no term must be distributed in the conclusion which is not distributed in the premises also follows from *the Dictum* in so far as no relation can be established with regard to the *whole* of the class denoted either by the subject or the predicate of the conclusion, unless that class has been compared in its entire extent with the middle term in the premises

When this rule is violated with regard to the major term, the fallacy is known as *the Illicit Process of the Major Term*, and when it is violated with regard to the minor term, the fallacy is known as *the Illicit Process of the Minor Term.*

Let us take an example —
    All Europeans are white,
    Some Mohamadans are Europeans,
    All Mohamadans are white

Here we can see plainly that when in the minor premise only a part of the class of Mohamadans has been compared with the class of Europeans, it cannot be possible, in the conclusion, to compare the whole class of Mohamadans with the class of white men

The fallacy in the above argument is the *Illicit Process of the Minor Term*, or simply *Illicit Minor*

The following is an example of the *Illicit Process of the Major Term*, or *Illicit Major* —
    All savages are black,

No European is a savage,

∴ *No European is black.*

Here the major term 'black' being the predicate of a nega
tive proposition is distributed in the conclusion, while, being
the predicate of an affirmative proposition, it is undistributed
in the major premise.

The student ought to draw suitable diagrams to illustrate
the above fallacies, as is done in the case of the previous rule.

The Fifth Rule that one of the premises must be affirma-
tive. "According to *the Dictum* the minor premise of a syllo-
gism, to which it directly refers, that is to say, of a syllogism
in which the middle term is subject in the major premise and
predicate in the minor, (technically called the First Figure),
must be affirmative, for it must declare that something can
be included in the 'class' (i.e., in the middle term). This,
when generalised, gives the rule that one, at least, of the pre-
mises must be affirmative." (*Welton.*)

The truth of the rule is plain in so far as no conclusion
can be derived with regard to the relation of the major and
minor terms unless some connexion has been established in
one of the premises between one of those terms and the middle
term. From mere negation of relation in the premises no-
thing definite can be inferred with regard to any kind of rela-
tion in the conclusion. This also might be illustrated by a
diagram.

The Sixth Rule that if one of the premises is negative,
the conclusion must be negative, and *vice versa.* "The

Dictum recognises the possibility of the original predication—that is the major premise in such a syllogism, as it directly applies to—being either affirmative or negative, and declares that the predication in the conclusion must be made in like manner As according to Rule V, the minor premise in such a syllogism is always affirmative, it follows that where both premises are affirmative the conclusion is affirmative, and when the major premise is negative, then and only then, the conclusion is negative as well By generalising this, we get the rule that a *negative premise necessitates a negative conclusion, and there cannot be a negative conclusion without a negative premise* "[1]

If one of the terms agrees wholly or partially with the middle term, for according to Rule V one of the premises must be affirmative, while the other does not, it is plain that there cannot be established a relation of agreement between these two terms in the conclusion, that is to say, the conclusion must be negative

Similarly, the converse of this is also true, viz , if the relation between the two terms in the conclusion is that of disagreement, there must be a relation of disagreement between one of the terms and the middle term in one of the premises In other words, if the conclusion is negative, one of the premises must also be negative

Corollaries —

The First Corollary that from two particular premises

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[1] *Intermediate Logic*, p 206

nothing can be inferred The possible combinations of particular premises are (1) *II*, (2) *I O*, (3) *O O*, and (4) *O I*.

In the case of *I I* both the premises being particular affirmative, the subject and the predicate of both the premises are undistributed, and so the middle term is also undistributed in both the premises, which is against Rule III, and so no conclusion can follow.

In the case of *I O* and *O I* one of the premises being negative, according to Rule VI the conclusion must be negative, and so the major term, being the predicate of a negative proposition, must be distributed Therefore, in order to have a valid argument it ought to be distributed in the major premise. That is to say, there ought to be at least two distributed terms in the premises, viz, the major term and the middle term. But I O, and O I can have between them only one distributed term. So if both the premises are particular, there is the fallacy of either Illicit Major, or Undistributed Middle

The Second Corollary that if one premise is particular, the conclusion also must be particular The possible combinations are *A I, A O, E I, E O, I A, O A, I E, and O E*

Of these *E O* and *O E* are not possible according to Rule V, both of them being negative

In the case of *A I* and *I A*, only one term is distributed, and that is to be the middle term So both the major and the minor terms must be undistributed in the premises and the conclusion And the minor term being the subject of the conclusion and undistributed, the conclusion must be particular.

In *A O, E I, O A* and *I E,* one of the premises being negative, the conclusion must be negative according to Rule VI, and consequently the major term, being the predicate of a negative conclusion, must be distributed   Being distributed in the conclusion it must also be distributed in the major premise. Now all these combinations of premises can have only two distributed terms—of which one being the major term and the other the middle term, the minor term must be undistributed in the conclusion, of which it is the subject.   In other words, the conclusion is particular

The Third Corollary that if the major premise is particular and the minor premise negative, no conclusion follows If the minor premise is negative, the major must be affirmative, for according to Rule V both the premises cannot be negative. Thus the major premise is particular affirmative, and as such, neither of its terms is distributed   But the minor premise being negative, the conclusion must be negative according to Rule VI, and hence the major term must be distributed in the conclusion.   But it cannot be distributed in the major premise, for neither of its terms is distributed   So there must be a fallacy of Illicit Major

4   Pure Hypothetical Syllogisms

In so far as pure hypothetical syllogisms admit of the same distinctions of quality and quantity as the categorical propositions, the rules of categorical propositions apply to them also   The following points ought to be remembered with regard to the structure of a hypothetical syllogism —

(*a*) In hypothetical propositions, the antecedent and the consequent are regarded as terms.

(*b*) The consequent of the conclusion corresponds to the major term, the antecedent of the conclusion to the minor term, and that which appears only in the premises to the middle term of a categorical syllogism.

(*c*) In conditional propositions the words 'in all cases,' 'always,' 'never,' 'sometimes' and 'sometimes not,' correspond respectively to 'all,' 'no,' 'some' and 'some not' in categorical propositions, and these words indicate the quantity of the antecedent and the proposition.

As regards the quantity of the consequent, it is distributed if it is part of a negative proposition, and undistributed if it is part of an affirmative proposition.

Example —

In all cases, if rain falls, corn is cheap;

In all cases, if a summer is very hot, rain falls,

In all cases, if a summer is very hot, corn is cheap

In this argument, 'If a summer is very hot' is the minor term, 'corn is cheap,' the major term; and 'if rain falls'; the middle term.   Both the premises are universal affirmative— A, the subject of both of them being distributed and the predicate undistributed

5.   PURE DISJUNCTIVE SYLLOGISMS

These are of very infrequent occurrence, and since dis-

junctive propositions are never negative, the syllogistic Rules V and VI do not apply to them   The rule with regard to the distribution of the middle term can be fulfilled only when one of the alternatives in the minor premise is the negative of one of those in the major premise

QUESTIONS AND EXERCISES

1   State the general canon of mediate inference   Give the rules of syllogism

2   Give the general canon of mediate inference, and deduce from it the principle that if one premise be negative the conclusion must be negative   (A U , 1894)

＜3   What is meant by the *Dictum de omni et nullo*?   Show of what importance it is in the science of Logic   Is this *dictum* applicable to the following arguments, and, if so, in what way?

(*a*) All dogs are quadrupeds,

All dogs are animals,

Some animals are quadrupeds

(*b*) Tennyson was the author of Aylmer's Field,

Tennyson was the Poet Laureate,

The Poet Laureate was the author of Aylmer's Field
(A U , 1896)

4   Explain the syllogistic rules respecting two negative and two particular premises, pointing out the grounds on which they rest   Do the following break either of these rules?

(*a*) This person is very able and also very industrious, conse-
quently some very able persons are very industrious

(*b*) No man is a proper object of contempt, at the same
time no man is perfectly admirable, consequently,
some men who are not perfectly admirable are not
proper objects of contempt   (A U , 1897)

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5.   Define syllogism   Is the following an instance of syllogistic reasoning or not?

> A is equal to B,
> B is equal to C,
> ∴ A is equal to C

Give reasons for your answer.

6.   Discuss the nature and use of syllogism   (A U, 1905)

7.   Prove the following rules of syllogism·—

> (*a*) The middle term must be distributed at least once in the premises.

> (*b*) No term must be distributed in the conclusion unless it is distributed in one of the premises

Give examples of fallacies due to the neglect of these rules

8   Name, define and illustrate the various parts of a categorical and a hypothetical syllogism

9   Classify syllogisms, giving definitions and examples

10   How far are the general rules of categorical syllogisms applicable to the pure hypothetical and disjunctive syllogisms?

11   Explain the nature of syllogism   Upon what principles have the names major, middle and minor been applied to the terms of a syllogism?   How for are these names generally applicable? (U I B, 1930).

CHAPTER III

FIGURES AND MOODS OF SYLLOGISM

1 THE FIGURES OF SYLLOGISM

These are the distinctions in the form of syllogism deter-mined by the position of the middle term in the premises.

Now the middle term can occupy the following four positions in the premises, and corresponding to them there are four Figures of syllogism In the following scheme, P stands for the major term, S for the minor term, and M for the middle term .

    (1) The middle term as subject in the major and pre-dicate in the minor premise

$$\frac{\begin{array}{l} M\text{---}P, \\ S\text{---}M, \end{array}}{S\text{---}P}$$

This forms the First Figure.

      All Europeans are white,
      All Englishmen are Europeans,
      All Englishmen are white

    (2) The middle term as predicate in both the premises:—

$$\frac{\begin{array}{l} P\text{---}M, \\ S\text{---}M, \end{array}}{S\text{---}P}$$

This forms the Second Figure.

All Europeans are white,

No savage is white,

∴ No savage is a European.

(3) The middle term as subject in both the premises —

M—P,

M—S,

∴ S—P.

This forms the Third Figure

All Europeans are white,

All Europeans are Aryans,

Some Aryans are white

(4) The middle term as predicate in the major and subject in the minor premise

P—M,

M—S,

∴ S—P.

This forms the Fourth Figure.

Some students are intelligent,

All intelligent persons are successful,

∴ Some who are successful are students

It might be noted that Aristotle originally recognised only the first three Figures, and the Fourth Figure was introduced by the Scholastic Logicians by way of formal symmetry and completeness   It is not usually natural to put arguments into the Fourth Figure, although it admits of as much formal accuracy and completeness as the rest.

2 Special Rules of the Four Figures

Each of the figures has some special rules with regard to the quality and quantity of the premises and the conclusion. They are given below —

(1) The Rules of the First Figure.

(a) *The minor premise must be affirmative.*

(b) *The major premise must be universal*

Proof of the rules —The form of the First Figure is

$$M—P,$$
$$S—M,$$
$$\overline{\quad\quad}$$
$$\therefore\ S—P.$$

(a) Now, if the minor premise is not affirmative, that is, if it is negative, the conclusion must be negative (General Rule, VI), and the major premise must be affirmative (General Rule, V) Consequently, the major term must be distributed in the conclusion (being the predicate of a negative proposition) and undistributed in the major premise (being the predicate of an affirmative proposition) This involves the fallacy of Illicit Major Hence the minor premise must be affirmative

(b) If the minor premise, as proved above, is affirmative, the middle term in it, which forms its predicate must be undistributed Therefore, it ought to be distributed in the major premise, (General Rule, III) But of the major premise the middle term forms the subject. Therefore, the subject of the major premise being distributed, it must be a universal proposition

Thus both the rules have been proved to be true.

(*ii*) The Rules of the Second Figure.

   (*a*) *One premise must be negative.*

   (*b*) *The major premise must be universal.*

Proof:—The form of the Second Figure is·

$$P—M,$$
$$\underline{\quad S—M,\quad}$$
$$\therefore S—P.$$

   (*a*) If one of the premises is not negative, that is, if both are affirmative, the middle term, being predicate in both of them must remain undistributed. Therefore, in order that the middle term be distributed at least once, one of the premises must be negative.

   (*b*) If one of the premises is negative, the conclusion must be negative (Rule, VI) and consequently, the major term must be distributed in the conclusion. Therefore, it ought also to be distributed in the major premise, of which it is the subject. The subject of the major premise being distributed, it must be a universal proposition.

(*iii*) The Rules of the Third Figure.

   (*a*) *The minor premise must be affirmative.*

   (*b*) *The conclusion must be particular.*

Proof:—The form of the Third Figure is:—

$$M—P,$$
$$\underline{\quad M—S,\quad}$$
$$\therefore S—P.$$

(*a*) Suppose the minor premise is not affirmative, that *i*

is, it is negative, the conclusion must be negative (Rule VI). and the major premise must be affirmative (Rule V). Consequently, the major term must be distributed in the conclusion and undistributed in the major premise   In other words, there must be the fallacy of *Illicit Major*.   Therefore, the minor premise cannot be negative   It ought to be affirmative

(*b*) If the minor premise is affirmative, the minor term, which forms its predicate, must be undistributed.   Consequently, it must be undistributed in the conclusion also   And it being the subject of the conclusion, the   conclusion   must be particular.

(*iv*) The Rules of the Fourth Figure.

   (*a*) *If one of the premises is negative, the major premise must be universal*

   (*b*) *If the major premise is affirmative, the minor premise must be universal*

   (*c*) *If the minor premise is affirmative, the conclusion must be particular*

Proof —The form of the Fourth Figure is —

$$P—M,$$
$$\frac{M—S,}{S—P}$$

   (*a*) If one of the premises is negative, the conclusion must be negative (Rule, VI), and in it the major   term   must   be   distributed   Consequently, it ought to be distributed in   the

major premise also.   But of the major prem
it is the subject; therefore, the major prem
must be universal.

(b) If the major premise is affirmative, the midd
term, which forms its predicate, is undistr
buted.   Therefore the middle term must I
distributed in the minor premise (Rule, III
But of the minor premise it is the subject; ther
fore, the minor premise must be universal.

(c) If the minor premise is affirmative, in it the mino
term, being the predicate, is   undistributed
Therefore, it must be undistributed in the con
clusion as well.   But of the conclusion it form
the subject.   Therefore, the conclusion mus
be particular.

3.   THE MOODS OF SYLLOGISM AND HOW TO
DETERMINE THEM

*The moods of syllogism are distinctions of form deter-
mined by the quality and quantity of the premises and the
conclusion.*

The following points are to be noted:—

(a) That all combinations of premises are not valid.

(b) That while some combinations are valid in one
figure, they are not so in others.

(c) That the same combination may be valid in more
than one figure.

Now in order to find out which moods are valid, and then

which of them are valid in what figures, let us examine all
the possible combinations   They are sixteen in number —

A A	E A	I A	O A
A E	E E	I E	O E
A I	E I	I I	O I
A O	E O	I O	O O

Of these E E, E O, O E, and O O cannot yield any con-
clusion according to Rule V, both of them being negative.

Then, I I, I O, and O I, cannot yield any conclusion ac-
cording to Corollary I, both of them being particular.

I E cannot yield any conclusion according to Corollary
III

Thus the following eight moods are left —

A A	E A
A E	E I
A I	I A
A O	O A

Now we shall examine each of these by the rules of the
respective figures and see which of them are valid in which
figures

The moods of the First Figure—The form of the First
Figure is

M—P,
S—M,
———————
S—P

and the rules are —

(1) *The minor premise must be affirmative*

(2) *The major premise must be universal.*

Now on testing by these rules we find that in the First Figure·—

A A is valid.

A E is not valid, the minor premise being negative.

A I is valid.

A O is not valid, the minor premise being negative.

E A is valid.

E I is valid.

I A is not valid, the major premise being particular.

O A is not valid, the major premise being particular.

Thus *A A, A I, E A* and *E I* are the valid combinations in the First Figure   These with their conclusion form the following moods.   The technical names given to them are also mentioned against each of them, the vowels in them representing the mood.

(1) *A A A—Barbara.*

(2) *A I I—Darii.*

(3) *E A E—Celarent.*

(4) *E I O—Ferio.*

The moods of the Second Figure.

The form is·

$$P—M,$$
$$S—M,$$
$$\overline{}$$
$$\therefore S—P.$$

The rules are.

(1) *One premise must be negative.*

(2) *The major premise must be universal*

Now of the eight possible combinations,

A A is not valid, both the premises being affirmative

A E is valid

A I is not valid, both the premises being affirmative

A O is valid

E A is valid

E I is valid

I A is not valid, both the premises being affirmative, and the major premise being particular.

O A is not valid, the major premise being particular

Thus we get the following moods by adding conclusion to the above valid combinations —

(1) *A E E—Camestres*

(2) *A O O —Baroco*

(3) *E A E—Cesare*

(4) *E I O—Festino*

The moods of the Third Figure

The form is

$$M—P,$$
$$\frac{M—S,}{S—P}$$

The rules are —

(1) *The minor premise must be affirmative*

(2) *The conclusion must be particular.*

By testing the eight combinations by these rules the following moods are found to be valid in the Third Figure —

(1) *A A I—Darapti.*

(2) *A I I—Datisi.*

(3) *E A O—Felapton.*

(4) *E I O—Ferison.*

(5) *I A I—Disamis.*

(6) *O A O—Bocardo.*

The student ought to apply the rules to all the eight combinations and see how the above are obtained.

The Moods of the Fourth Figure.

The form is —

$$P—M,$$
$$\underline{M—S,}$$
$$.\ S—P$$

The Rules· (1) *If one of the premises is negative, the major premise must be universal*

(2) *If the major premise is affirmative, the minor premise must be universal.*

(3) *If the minor premise is affirmative, the conclusion must be particular.*

Now by testing the possible combinations of premises, by the first two of these rules the following moods are found to be valid in the Fourth Figure —

(1) *A A I—Bramantip.*

(2) *A E E—Camenes.*

(3) *E A O—Fesapo.*

(4) *E I O—Fresison.*

(5) *I A I—Dimaris.*

The student ought to apply the rules and see how the above moods are obtained

The Mnemonic Lines —All the moods in the various figures have been given technical names, the vowels in which represent the constituent propositions of the mood, and some of the consonants are the signs of certain processes which are to be employed for what is technically called 'Reduction'. These will be explained in the next chapter   These names have been embodied in the following mnemonic lines, which ought to be carefully learnt by the student —

Barbără, Cēlārent, Dărĭı, Fĕrĭóque prioris

Cēsārĕ, Cāmēstres, Festĭnŏ, Bărōcŏ, secundæ

Tertia, *Dārapti Dĭsămıs Dātĭsĭ, Fĕlapton,*

Bōcardō, Fērīsōn, habet   Quarta insuper addit

Brămantıp, Cămenes, Dĭmarıs, Fēsăpŏ, Frĕsīson

5   STRENGTHENED AND WEAKENED SYLLOGISMS

Of the valid moods the following are called *Strengthened Syllogisms*, because in each of them one of the premises may be reduced to its subaltern without affecting the quality of the conclusion —

(1) *A A I, in Figure III*

(2) *E A O, in Figures III and IV*

(3) *A A I, in Figure IV*

Of these in (1) and (2) the middle term is distributed twice, and in (3) the distribution of the major term is not demanded by the conclusion

The following moods are called *Weakened Syllogisms*

or Subaltern Moods because in each of them we draw a particular conclusion when the premises justify a universal inference.

(*1*) *A A I, in Figure I.*
(2) *E A O, in Figures I and II*
(3) *A E O, in Figures II and IV*

6. MOODS OF PURE HYPOTHETICAL AND PURE DISJUNCTIVE SYLLOGISMS

As hypothetical propositions admit of the same distinctions of quality and quantity as the categorical propositions all the figures and moods of the categorical syllogism are possible in the case of hypothetical syllogism, and the same rules apply to them also   We shall give an example of hypothetical syllogism in each of the figures

(1)   *Figure I—Barbara.—*
    If any S is X, that S is P,
    If any S is M, that S is X,
'   *If any S is M, that S is P.*
    If any student is diligent, he is successful,
,   *If any student is obedient, he is diligent,*
.   *If any student is obedient, he is successful.*

(2)   *Figure II—Cesare.*
٠, *If any S is P, it is never X,*
    If any S is M, it is always X,
'   *If any S is M, it is never P.*   '   ٠, ,
'. *If any student is dishonest, then never does he* ⏐

If any student is pious, he always prospers

· *If any student is pious, he is never dishonest*

(3) *Figure III—Bocardo.*

If S is X, sometimes it is not P,

If S is X, always it is M,

If S is M, sometimes it is not P

If a student is diligent, sometimes he is not

successful,

If a student is diligent, always he is regular,

· *If a student is regular, sometimes he is not*

successful

(4) *Figure IV—Dimaris*

If S is P, it is sometimes X,

If S is X, it is always M,

If an S is M, it is sometimes P

If a student is intelligent, he is sometimes diligent

If a student is diligent, he is always successful,

If a student is successful, he is sometimes intelligent

The student, by way of exercise, may frame hypothetical syllogisms in other figures and moods

As for *pure disjunctive syllogisms* they can yield only an affirmative conclusion, for no disjunctive proposition is negative, therefore, only the affirmative moods are possible, and of these too, only *Barbara* is of any importance Pure disjunctive syllogisms are of rare occurrence

It is to be noted further that we can get a middle term in a disjunctive syllogism only when one of the alternatives

mentioned in the major premise is negatived in the minor premise. From the following premises no conclusion can be drawn:

> S *is either* P *or* Q,
> S *is either* P *or* R.

The premises only signify that S is either P, or Q, or R, which is no inference.

The following premises can, however, yield a conclusion:

> S *is either* P *or* Q,
> S *is either* $\overline{P}$ *or* R.

The conclusion being S is either Q or R.

The above argument will be more clear when put into the form of the following hypothetical syllogism:

> *If* S *is* $\overline{P}$, *it is* Q,
> *If* S *is* R, *it is* $\overline{\overline{P}}$,
> ∴ *If* S *is* $\overline{R}$, *it is* Q.

The above conclusion being equal to the disjunctive proposition 'S is either Q or R'.

Concrete Examples.

> *A student is either an athlete or studious,*
> *A student is either a non-athlete or stout,*
> *A student is either studious or stout*

The above put into the form of a hypothetical syllogism will be as follows:—

> *If a student is a non-athlete, he is studious,*
> *If a student is not stout, he is a non-athlete,*

If a student is not stout, he is studious

7   SPECIAL CHARACTERISTICS OF THE FIGURES

It has already been said that Aristotle regarded the First Figure as the only perfect form of syllogistic inference However, each figure has its own characteristics. These have been summarised by Lambert thus   'The First Figure is suited to the discovery or proof of the properties of a thing, the Second to the discovery or proof of the distinctions between things, the Third to the discovery or proof of instances and exceptions, the Fourth to the discovery or exclusion of the different species of a genus" [1] It may be noted that the relation of species to genus is much more satisfactorily established by a syllogism in the First Figure, in which the name of the species is the minor term, and that of the genus the major term

HINTS AND EXAMPLES

1   (*a*) The position of the middle term in each of the figures, (*b*) the special rules of the four figures, and (*c*) the mnemonic lines, all these ought to be carefully learnt and remembered

2   The proof of the *special rules* of the figures depends almost invariably upon the distribution or non-distribution of terms as required by the general rules of syllogism.   So the general rules ought to be learnt and remembered well   The way how the rules are to be proved can be seen from the text

3   The determination of the valid moods of syllogistic inference is based upon the application of the general rules of syllogism,

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[1] Quoted in Welton s *Manual of Logic*, pp 314-15

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and of the moods of each of the figures upon that of their special rules   The way how these are determined is given in the text

     4   In order to put an argument into syllogistic form proceed as follows

    (*a*) Read the argument carefully and find out the conclusion first, that is, that which has to be proved, and put it into strict logical form carefully distinguishing the subject and the predicate, which respectively form the minor and the major terms in a syllogism

    (*b*) Find out, if given, the middle term, and combining it with the major term construct the major premise, and with the minor term, the minor premise

    In case the middle term is not expressed, provide a suitable middle term, and frame the premises as explained above

    (*c*) Try to make the argument conform as much to the general syllogistic rules and the rules of the figures as it is possible to do on the basis of the information provided in the original statement

    (*d*) The figure and the mood of a syllogism depend upon the nature and matter of the argument

    (*e*) If a syllogism is to be framed without there being given any datum for it, the same procedure as given above is to be followed except that you have also to provide a conclusion and a middle term of your own

QUESTIONS AND EXERCISES

    1   What is meant by the figure and mood of a syllogism?

    "A science is either a pure, inductive or mixed science, Astrology is neither of these, therefore Astrology is not a science"

    What is the name given to an argument of this kind?   Express the above argument in the form of a categorical syllogism, and state what is its mood and figure   (A U, 1893)

    2   What gives rise to the distinction of moods and figures in syllogisms?   Which of the following moods are valid, and in which figures —

OAO, EIO, IEO, EAE, IIA, LLO, AIT, OIO, EAO   Give reasons for excluding the moods which you reject   (A U, 1894)

3   Select the valid moods from among the following, and state in what figures they are valid   IAI, OOO, LOL, IIA, AAA, EAL

4   What figure must have a negative conclusion?   Why must it?

If the premises of syllogism are false, does this make the reasoning false?

5   "There are no young men applying for this post, so you may be sure that there are no students among the applicants"   Supply a premise that will make the reasoning correct   Can you supply a premise that will make it (i) guilty of illicit process of the major, (ii) guilty of illicit process of the minor   (A U, 1896)

6   Find premises to prove the following propositions,   state the mood and figure of the syllogism you construct, and state whether the same conclusion could be arrived at in any other syllogistic moods —

(a) Not all the unhappy are evil-doers

(b) Lazy people never prosper

(c) Buildings are made to live in   (A U, 1896)

7   State clearly what you understand by mood, figure, reduction, and weakened conclusion   Are figure and mood necessary for *all* kinds of reasoning?   Illustrate your answer

8   Prove (a) that when the minor term is a predicate in its premise, the conclusion must not be an A proposition, and (b) that if the conclusion of a syllogism be a universal proposition, the middle term can be *but once* distributed in the premises   (A U, 1899)

9   Prove that in Fig III the minor premise must be affirmative, and that in Fig II the major premise must be universal   (A U, 1900)

10   (a) Prove the special rules of the Second Figure

(b) Given that the major term is distributed in the pre-

mises and undistributed in the conclusion of a valid syllogism, determine the syllogism   (A U, 1901)

   11   Prove the following syllogistic rules —

   (a) In the First Figure the minor premise must be affirmative

   (b) In the Second Figure the conclusion must be negative.

   (c) In the Third Figure the conclusion must be particular
        (A U, 1902)

   12   (a) Define Syllogism, Figure, Mood, Illicit Process

        (b) Supply the premises required to complete the following arguments —

        (i) Blessed are the meek,   for   they   shall   inherit   the earth

        (ii) He must be in York, for he is not in London

        (iii) Whales are not true fishes, for they respire air, moreover, they suckle their young

   13   Prove the special rules of the Second Figure   (A U, 1903)

   14   Define Figure and Mood   Explain the nature and peculiarities of each of the figures   State and prove the special rules of the First Figure   (A U, 1907)

   15   Show by means of a concrete example the relations between the disjunctive, hypothetical and categorical forms of the syllogism   (A U, 1907)

   16   Prove by the general syllogistic rules that in the Second Figure the major premise must be universal, and in the Third Figure the minor premise must be affirmative   (A U, 1908)

   17   (a) What is the figure of a syllogism and what is the mood? How is each related to the other?

        (b) Prove that an A conclusion is valid in one syllogistic figure,   (A. U, 1909)

   18. Prove that   (a) The mood IEO violates the special rules of all the figures

(*b*) The mood AEO is superfluous in every figure

(*c*) Wherever the minor premise is negative, the major must be universal

19   (*a*) Prove that in the first figure, (*i*) the major premise must be universal, (*ii*) the minor premise must be affirmative.

(*b*) Prove that in every figure if the minor premise is negative, the major premise must be universal   (A U, 1913)

20   Distinguish between a weakened and a strengthened syllogism   Determine whether EAO is weak or strong in each of the figures   (A U, 1914)

21   (*a*) Two premises differ in quantity and quality, if the one is major, the syllogism is valid in every figure, but if the other, the syllogism is valid in none   Find the premises

(*b*) The conclusion being universal, what do you know about the distribution of the middle term?

(*c*) Prove that when the major term is predicate in its own premise, the minor premise is affirmative   (A U, 1914)

22   Give the meaning of, and one example of each of *four* of the following —

Dichotomy, sub-contrary, property, illicit process, equivocal, Camestres, weakened conclusion   (A U, 1915)

23   Give the conclusion of the following pairs of premises assigning the completed syllogisms to their moods and figures, and prove by reduction, where necessary —

(*a*) No Englishmen like to eat frogs,
        All Frenchmen like to eat frogs

(*b*) All clear explanations are satisfactory,
        Some excuses are unsatisfactory

(*c*) Some snakes are poisonous,
        All poisonous creatures are to be avoided

(*d*) No philosophers are illogical,

All illogical persons are obstinate   (A U, 1915).

24.   Examine the moods AAA, EIO and IEO throughout the figures, showing where they are valid or invalid, and for what reasons   (A U., 1916).

25   Prove that (*a*) IEO violates the special rules of all the figures, (*b*) the mood AEO is superfluous in every figure,   (*c*) whenever the minor premise is negative, the major must be universal.   (A. U, 1917).

26   Explain with examples,   the various forms of the so-called hypothetical and disjunctive syllogism, and show how hypothetical and disjunctive propositions can be reduced to the categorical form

27   From the general syllogistic rules prove—

(*a*) That in the First Figure the conclusion must   have   the quality of the major premise and the quantity of the minor

(*b*) That in the Third Figure, the conclusion must be particular and have the quality of the major premise

(*c*) That when the minor term is predicate in its premise, the conclusion cannot be A

28   Construct a disjunctive argument of the form

Every A is either B, or is not C,

These A's are C, therefore, etc

Reduce your concrete example to the conditional form and the latter to a categorical syllogism

What is the name of the conditional form, and of the mood of the categorical syllogism   (A U, 1918)

29   (*a*) If in a syllogism the major term be universal in the premises and particular in the conclusion, determine the mood and figure, it being understood that the conclusion is not   a   weakened one

(*b*) Aside from the special rules of the figure, why can not O stand as a premise in the First Figure?   (A U, 1919)

30   "Boys being what they are, it is not easy for them to believe in the importance of what they are doing if they see that in fact it is not required of all their school-fellows From the school-boy's point of view it is perfectly sound logic to argue that since boys may drop almost any subject, no subject can really be important "

State in syllogistic form the argument of the school-boy implied in the above quotation, and name the mood and figure Estimate its logical value from any other point of view than the school-boy's   (A U, 1920)

31   Prove that (1) in every figure, if the minor premise is negative, the major must be universal, if the conclusion of a syllogism be universal, the middle term cannot be distributed twice in the premises   (A U, 1920)

32   Prove the following special rules of the figures with illustrations to show the fallacies that result from a breach of them —

(a) In the Third Figure the conclusion must be particular

(b) In the Fourth Figure if either premise is negative, the major must be universal

33   Show that   (a) if the middle term is distributed twice in the premises, the conclusion is particular, (b) if a mood has a particular affirmative for its major premise, and a universal negative for its minor premise, it is invalid.   (U I B, 1924)

34   Define figure and mood   Show that O cannot occur as major or minor in the First and Fourth figures, as major in the Second, and as minor in the Third figure   (U I B, 1925)

35   Prove that in the Fourth Figure

(a) O cannot be a premise, (b) A cannot be the conclusion (U I B, 1927)

36   Define Figure and Mood   Determine the Figure and Mood of the syllogism under each of the following conditions, giving reasons for your answer —

(i) When only one term is distributed, and that only once.

(ii) When only one term is dstributed, and that twice

(iii) When two terms only are distributed, each only once.
(U I B, 1930)

CHAPTER IV
REDUCTION OF SYLLOGISMS

1 DEFINITION AND KINDS OF REDUCTION

Reduction is the process of translating moods in the figures other than the First into a mood of the *First Figure* The aim of this process, according to Aristotle, was to show the validity of arguments in the Second and the Third figures, by reducing them to the form of the First Figure For according to him, only the First Figure is to be regarded as perfect and the most evident Now when a fourth kind of figure has been introduced, arguments in that figure can also be reduced to one of the moods of the First Figure

Reduction is of two kinds (1) Direct or Ostensive Reduction, and (2) Indirect Reduction

2 DIRECT OR OSTENSIVE REDUCTION

It is the process of reducing an argument in any of the last three figures to one of the moods of the First Figure by any of the processes of eduction, or by transposition of the premises, or by both

The processes, by which a certain mood in any of the last three figures is to be reduced to the First Figure, are indicated in the mnemonic lines, which for the sake of reference are given below —

Barbara, Celarent, Darii, Ferioque prioris
Cesare, Camestres, Festino, Baroco, secundæ.
Tertia, *Darapti, Disamis, Datisi, Felapton,*
Bocardo, Ferison habet·   Quarta in super addit
Bramantip, Camenes, Dimaris, Fesapo, Fresison.
Explanation of these lines:—

(1) The initial letters of the moods of the First Figure are the first four consonants and indicate that the moods in the other figures, the names of which begin with the same letters, are to be reduced to those same moods in the First Figure. For example, *Camestres* in the Second is to be reduced to *Celarent*, *Disamis* of the Third to *Darii*, and *Fesapo* of the Fourth to *Ferio* of the First Figure.

(2) 'S' denotes simple conversion of the preceding proposition, e g , in *Cesare*, 'S' means that the preceding proposition E, viz , the major premise of the syllogism, is to be converted simply.

(3) 'P' means that the preceding proposition is to be converted *per accidens*, e g., in *Darapti*, 'P' means that the preceding proposition A, viz , the minor premise of the syllogism, is to be converted *per accidens*.

(4) 'M' signifies the transposition of the premises, that is, the major becomes the minor, and the

minor becomes the major premise   For exam-
ple, in *Camenes*, the premises are to be trans-
posed

(5) 'C' indicates that the mood is to be reduced by
the indirect method   Thus *Baroco* and *Bocardo*
are the only moods which are to be reduced in-
directly   However, these too can be reduced
directly, if we call *Baroco Faksoko*, and *Bocardo
Doksamoks*, and take 'K' to mean obversion
of the preceding proposition, and 'KS' the
converted obversion, i e , contraposition of the
preceding proposition

It has already been said that the vowels represent the
names of the moods   The remaining letters, viz , 'r', 't', 'l',
'n', and also 'b' and 'd', when they are not initial, are mean-
ingless

Examples of Direct or Ostensive Reduction —

(1) *Camestres of the Second Figure*

All P is M, (A)
No S is M, (E)
———————————
No S is P   (E)

Now in '*Camestres*', 'S' denotes that the minor premise
and the conclusion are to be converted simply, and 'M' denotes
that the premises are to be transposed   Having done this we
get the following syllogism in the mood *Celarent* of the
First Figure

No M is S, (E)—converse of the original minor
All P is M, (A)—the original major

∴ *No P is S, (E)—converse of the original conclusion.*

A concrete example·—

The original syllogism in the mood *Camestres* —

All Europeans are civilised,   (*A*)

No savage is civilised,   (*E*)

∴ *No savage is a European*   (*E*)

Reduction of the above.—

No civilised persons are savages, (E)—converse of the original minor·

All Europeans are civilised persons, (A)—the original major,

∴ *No European is a savage (E),—converse of the original conclusion.*

This is *Celarent* of the First Figure

(*ii*) *Datisi of the Third Figure*

All M is P,   (*A*)

Some M is S,   (*I*)

∴ *Some S is P*   (*I*)

Reduction of the above   'S' in *Datisi* denotes that the minor premise is to be converted simply. So we get the following syllogism in the mood *Darii* of the First Figure —

All M is P, (A)

Some S is M, (I)·—converse of the original premise.

Some S is P (I)

(*iii*) *Bocardo of the Third Figure*—'C' denotes that this mood is to be reduced by the indirect method However, if we replace the name by *Doksamoks*, we can reduce it directly to the mood *Darii* of the First Figure Let us take a concrete example —

> Some *Indians are not Aryans*, (O)
> All *Indians are Asiatics*,　　　(A)
> Some *Asiatics are not Aryans* (O)

Reduction of the above 'KS' in *Doksamoks* denotes the converted obversion of the major premise and the conclusion, and 'M' denotes the transposition of the premises
The obverse of the major premise is
Some Indians are not-Aryans, (I)
The converse of the above, and the converted obverse of the major premise is "Some not-Aryans are Indians", (I)

Now by making the original minor premise major, and the converted obverse of the original major premise minor, and the converted obverse of the original conclusion the conclusion, we get the following syllogism in the First Figure —

> All *Indians are Asiatics*,　　　(A)
> Some *not-Aryans are Indians*,　(I)
> Some *not-Aryans are Asiatics* (I)

This is the mood *Darii*

Similarly, *Baroco* of the Second Figure, which is also reduced usually by the indirect method can be reduced directly under the name of *Faksoko*

(*iv*) *Bramantip of the Fourth Figure*

'M' denotes that the premises are to be transposed, and 'p' signifies that the conclusion is to be converted.

Let us take a concrete example.

> All Englishmen are Europeans,   (A)
> All Europeans are whitemen,   (A)
> ∴ Some white men are Englishmen.   (I)

Now by transposing the premises and converting the conclusion we get the following syllogism in *Barbara*.

> All Europeans are white men,   (A)
> All Englishmen are Europeans,   (A)
> ∴ All Englishmen are white men.   (A)

(The original conclusion is the converse of this conclusion).

3   INDIRECT REDUCTION

Indirect Reduction, also called *Reductio per deductionem ad impossibile, or Reductio per impossibile, or Reductio ad absurdum,* is the process of proving the validity of the conclusion of a syllogism by proving the invalidity of it contradictory with the help of a new syllogism in the First Fgure.

This method is applied usually only to *Baroco* and *Bocardo*, although it is equally applicable to any other mood. It is based upon *the Principle of Contradiction.*

The indirect method consists of the following steps:—

> (1) Take the contradictory of the original conclusion and combine it with one of the premises of the original syllogism so as to frame a syllogism in the First Figure.

(*ii*) Show that the conclusion of the new syllogism
is the contradictory of the other premise of
the original syllogism, which being true this
conclusion is false

(*iii*) The conclusion of the new syllogism being false
both the premises, or one of them, must be
false   But of these the premise taken from
the original syllogism is true, therefore the
other one, which is the contradictory of the
conclusion of the original syllogism, is false
This premise being false, the original conclu-
sion, which is its contradictory, is true

Indirect Reduction of Baroco

All boys are fond of play, (*A*)

Some students are not fond of play, (*O*)

Some students are not boys   (*O*)

Now if the conclusion of this syllogism is not valid, its
contradictory must be valid   Its   contradictory   is   "All
students are boys "

Having combined this with the major premise of the
original syllogism, we get the following argument in the
First Figure —

All boys are fond of play,   (*A*)

All students are boys,   (*A*)

All students are fond of play. (*A*)

Now this conclusion is the contradictory of the minor
premise of the original syllogism, which being true, this con-
clusion is false

Now if the conclusion is false, one or both of the premises must be false. But the major premise, being the premise of the original syllogism, is true. Therefore the minor premise 'All students are boys' is false. But this is the contradictory of the conclusion of the original syllogism. Therefore the original conclusion is true. Thus the validity of the conclusion has been established

Similarly *Bocardo* can also be reduced by the indirect method.

4. REDUCTION OF PURE HYPOTHETICAL SYLLOGISM

As the validity of reduction depends upon the validity of the processes of eduction employed for that purpose, and hypothetical propositions admit of those processes, it follows that pure hypothetical syllogisms can be reduced in the same way as the categorical syllogisms   For example, take *Festino* of the Second Figure and reduce it to *Ferio* of the First Figure

> If any S is X, it is never P, (E)
> If any S is M, sometimes it is P, (I)
> ∴ If any S is M, sometimes it is not X, (O)

Now 'S' in *Festino* denotes that the major premise is to be converted for the purpose of reduction. So by converting it we get the following syllogism in the First Figure

> If S is P, it is never X, (E)
> If any S is M, sometimes it is P, (I)
> ∴ If any S is M, sometimes it is not X.   (O).

This is the mood *Ferio.*

The following is an argument in *Festino,* Second Figure

If any student is lazy, he is never successful, (E)

If any student is intelligent, sometimes he is suc-
cessful, (I)

∴ *If any student is intelligent, sometimes he is not*
lazy. (O)

which being reduced to the First Figure stands as
follows —

If any student is successful, he is never lazy (E)

If any student is intelligent, sometimes he is suc-
cessful, (I)

. *If any student is intelligent, sometimes he is not*
lazy. (O)

Similarly other moods of pure hypothetical syllogisms
can be reduced

HINTS FOR REDUCTION

(1)   Suggestions for the reduction of each   mood   are   con-
tained in the mnemonic lines, and therefore   these   together   with
what they indicate ought to be learnt and remembered well

(2)   The method of reduction—both direct and indirect, is
illustrated in the chapter   That ought to be carefully studied and
practised by the student by reducing moods other than those re-
duced in the text

(3)   Unless mentioned otherwise, all the   methods,   except
Baroco and *Bocardo,* ought to be reduced by the direct method of
reduction.

QUESTIONS

1. What is *reduction* in Logic? Whence does the necessity for reduction arise?

Prove the validity of the mood E I O of the Second Figure; of the mood O A O of the Third, and of the mood I A I of the Fourth, by reducing them ostensively to the First Figure (A U., 1898).

2. Define reduction Why is reduction at all necessary? Frame a syllogism in *Bramantip* and reduce it *indirectly* (A U., 1895)

3. (*a*) Explain the nature and use of reduction

(*b*) Take any two moods in the Fourth Figure, and reduce one of them by the direct and the other by the indirect method. (A. U, 1904).

4. What is reduction? Define Direct and Indirect Reduction Construct a syllogism in *Baroco* and reduce it by both methods (A U, 1908).

5. Construct syllogisms in Camestres, Felapton, and Fresison, and reduce them to the corresponding mood of the First Figure (A. U, 1910).

6 What is reduction? Explain by concrete syllogistic example the process of Indirect Reduction as applied to Bocardo. (A U, 1913)

7 Throw the following arguments into logical form and reduce them to the First Figure.—

(*a*) He would not take the crown,
    Therefore 'tis certain he was not ambitious

(*b*) Ramchandra of Delhi is a proof that science and religion are by no means incompatible. (A U, 1914).

8. What do you understand by reduction? What is its

value? Express the following enthymemes in syllogistic form and reduce them to the First Figure *

    (*a*) Spiders are not insects, for they have not six legs

    (*b*) Some water animals are mammals, since all whales are

    9   (*a*) Construct a syllogism in *Disamis* to prove that some literature is pernicious, and reduce it to the First Figure

    (*b*) Construct a syllogism in *Baroco* to prove 'Some strikes are not justifiable', and reduce it by the Indirect Method

    10   Construct an argument in *Bramantip* and reduce it to the First Figure   (A U, 1918)

    11   Construct a concrete syllogism in *Felapton*, and reduce it to some mood in the Second Figure   (A U, 1919).

    12   Construct a concrete syllogism (not using symbols) in *Darapti*, and reduce it to the First Figure Explain clearly the purpose of Reduction   (A U, 1920)

    13   What do you understand by reduction? Reduce the following syllogisms to the First Figure —

    (*a*) All students of this class are well prepared,

        No idle students are well prepared,

          No idle students are students of this class

    (*b*) No fixed stars are planets,

        All planets shine brightly,

          Some brightly shining bodies are not fixed stars
        (A U, 1922)

    NOTE—Enthymemes are those syllogisms in which a premise is suppressed. That can readily be supplied by the method already indicated at the end of the previous chapter

CHAPTER V

MIXED SYLLOGISMS

1. KINDS OF MIXED SYLLOGISMS

As has already been noted Mixed Syllogisms are of three kinds:—

(*a*) *Mixed Hypothetical or Hypothetical-Categorical Syllogisms*, in which the major premise is hypothetical and the minor and the conclusion categorical.

(*b*) *Mixed Disjunctive or Disjunctive-Categorical Syllogisms*, in which the major premise is disjunctive and the minor categorical.

(*c*) *Dilemmas or Conjunctive-Disjunctive Syllogisms*, one premise of which is conjunctive and the other disjunctive. Strictly speaking, a conjunctive proposition is a compound proposition consisting of two categoricals or two hypotheticals connected by the conjunctions 'neither—nor', or 'as well as.'

When the two constituent propositions are connected by 'neither—nor', the conjunctive proposition is called *Remotive*, and when they are connected by 'as well as' it is called *Copulative*.

2. MIXED HYPOTHETICAL OR HYPOTHETICAL-CATEGORICAL SYLLOGISMS

The rules of this kind of syllogism are as follows:—

(1)   To affirm the antecedent is to affirm the consequent

(2)   To deny the consequent is to deny the antecedent.

When the consequent is affirmed by affirming the antecedent, the syllogism is said to be *Constructive*, or in the *Modus Ponens*.

When the antecedent is denied by denying the consequent, the syllogism *is said to be Destructive*, or in the *Modus Tollens*

There are four forms of each of the above two kinds of syllogisms based upon the quality of the minor premise and the conclusion   *Ponens* signifies an affirmative, and *Tollens* a negative quality.

(1) *Modus Ponens*

(a) *Modus Ponendo Ponens*, in which the minor premise and the conclusion are both affirmative.

If A is, C is,

A is,

_____

C is

If rain falls, corn is cheap,

Rain falls,

_____

Corn is cheap.

(b) *Modus Ponendo Tollens*

If A is, C is not,

A is, (*Affirmative*)

_____

C is not   (*Negative*)

If rain falls, corn is not dear,

<u>Rain falls,</u>

. Corn is not dear.   (Negative.)

(c) *Modus Tollendo Ponens.*

If A is not, C is,

<u>*A is not, (Negative.)*</u>

∴ *C is.*   (*Affirmative*)

If rain does not fall, corn is dear,

<u>Rain does not fall,</u>

Corn is dear.

(d) *Modus Tollendo Tollens*

If A is not, C is not,

<u>*A is not,*</u>

. *C is not.*

If rain does not fall, corn is not cheap,

<u>Rain does not fall,</u>

. Corn is not cheap

(2) *Modus Tollens*

(a) *Modus Tollendo Tollens.*

If A is, C is,

<u>*C is not, (Negative).*</u>

. *A is not.*   (*Negative*).

If there is a heavy rainfall, there is malaria,

<u>There is no malaria,</u>

. There is no heavy rainfall.

(b) *Modus Ponendo Tollens.*

If A is, C is not,

<u>*C is, (Affirmative)*</u>

A *is not* (*Negative*)

If the weather is dry, there is no malaria,

There is malaria,

___

The weather is not dry

(c) *Modus Tollendo Ponens*

If A *is not*, C *is*,

C *is not*, (*Negative*)

___

A *is* (*Affirmative*)

If the weather is not dry, there is malaria,

There is no malaria,

The weather is dry

(d) *Modus Ponendo Ponens*

If A *is not*, C *is not*,

C *is*, (*Affirmative*)

___

A *is* (*Affirmative*)

If the weather is not wet, there is no malaria,

There is malaria,

___

The weather is wet

It is to be noted that if a mixed hypothetical syllogism, which violates any of the two canons, is reduced to the categorical form there is the fallacy of *Illicit Major* if the first canon is violated, and the fallacy of *Undistributed Middle* if the second rule is violated

For example, take the following argument

If all workers go on strike, the wages will be increased,

All workers have not gone on strike,

___

The wages will not be increased

This when reduced to the categorical form:

> The case of all workers going on strike is a case of the
>   increase of wages,
> This is not a case of all workers going on strike,
> ∴ This is not a case of the increase of wages.

It is found that there is *the fallacy of Illicit Major*, the major term being distributed in the conclusion while it is undistributed in the premise.

Again, take another argument in which the second rule is violated:

> If the weather remains dry, there is no malaria,
> There is no malaria,
> ∴ The weather remains dry.

Reduced to the categorical form it stands thus:

> The case of the weather being dry is the case of there
>   being no malaria,
> This is a case of there being no malaria,
> ∴ This is a case of the weather being dry

Here we find that there is *the fallacy of Undistributed Middle.*

3. MIXED DISJUNCTIVE OR DISJUNCTIVE—CATEGORICAL SYLLOGISMS

The canon of inference from a disjunctive proposition is this: *To deny one member or more of a number of alternatives is to affirm the other member or members.* If the alternatives in a disjunctive proposition be mutually exclusive, the assertion of one of them might lead to the denial of the other

or others, but a disjunctive proposition does not formally imply such a mutual exclusion of alternatives

According to the above canon of disjunctive form of reasoning, therefore, only one mood, viz , the *Modus Tollendo Ponens* is possible However, as both the alternatives may be either affirmative or negative, this admits of four forms The minor premise and the conclusion may be either affirmative or negative categorical propositions The four forms are as follows —

(*i*)   *Either X is, or Y is,*

   X is not,
   _____
   Y is

(*ii*)   *Either X is, or Y is not,*

   X is not,
   _____
   Y is not

(*iii*)   *Either X is not, or Y is,*

   X is
   _____
   Y is

(*iv*)   *Either X is not, or Y is not,*

   X is,
   _____
   Y is not

Concrete Examples

(*i*) Every case of failure is due either to negligence or want of aptitude,

   This case of failure is not due to negligence,
   _____
   This case of failure is due to want of aptitude

(*ii*) Every religion is devotion to God, or it is not a
true religion,

Every religion is not devotion to God,

Every religion is not a true religion.

(*iii*) A student who fails is either not intelligent or he
is lazy,

This student who fails is intelligent,

This student who fails is lazy

(*iv*) A student who fails is either not intelligent, or not
industrious,

This student who has failed is intelligent,

∴ This student who has failed is not industrious.

4. DILEMMAS OR CONJUNCTIVE—DISJUNCTIVE SYLLOGISMS

*A dilemma is a syllogism consisting of a compound hypo-
thetical major premise and a disjunctive minor premise.* The
major premise contains a number of antecedents or conse-
quents, which are either disjunctively affirmed, or disjunctively
denied in the minor premise When such an argument is
employed rhetorically, the alternatives offered are of such a
kind that the acceptance of any one of them leads to a con-
clusion which would be disagreeable to an opponent. Hence
the phrase 'to be on the horns of a dilemma'. A dilemma,
strictly speaking, contains only two alternatives.

A conjunctive-disjunctive argument containing three
alternatives is called a *Trilemma*.

A conjunctive-disjunctive argument containing four alternatives is called a *Tetralemma*

A conjunctive-disjunctive argument containing more than four alternatives is called a *Polylemma*

All these arguments are governed by the same rules as the dilemma

Forms of the Dilemma

(1) *Constructive Dilemma* When the antecedents are affirmed the dilemma is said to be *constructive* Then this is either (*a*) *Simple*, or (*b*) *Complex*.

(*a*) A *Simple Constructive Dilemma* is one in which in the major premise there are two antecedents, and one consequent which the conclusion affirms in the simple categorical form

If either A is or B is, then C is,

Either A is or B is,

∴ *C is*

> If a student is either intelligent or diligent, he is successful,
>
> This student is either intelligent or he is diligent,
>
> This student is successful

(*b*) A *Complex Constructive Dilemma* is one in which in the major premise there are two antecedents and two consequents, and the conclusion is disjunctive

If A is then C is, and if B is then D is,

Either A is or B is,

∴ *Either C is or D is.*

If a student is industrious, he is successful; and
if he is lazy, he fails,

Either a student is industrious, or he is lazy,

∴ Either a student is successful, or he fails.

(*ii*) *Destructive Dilemma* is that in which the con-
sequent, or consequents, is denied. This is
again *Simple* and *Complex*.

(*a*) *A Simple Destructive Dilemma* is one in which
there is one consequent in the major premise
which is denied in the minor, and the conclusion
is a categorical proposition.

If A is, then both C and D are,

Either C is not, or D is not,

∴ *A is not*

If a man is rich, he is both thrifty and indus-
trious,

This man is either not thrifty, or he is not in-
dustrious,

∴This man is not rich.

(*b*) *A Complex Destructive Dilemma* is one in which
there are two antecedents and two consequents in the major
premise which are denied in the minor, and the conclusion is
disjunctive.

If A is then C is, and if B is then D is,

Either C is not, or D is not,

Either A is not, or B is not

If a country is cold, it is healthy, and if a country is hot, it is unhealthy,

Either a country is not healthy, or it is not unhealthy,

Either a country is not cold, or it is not hot

The Constructive and Destructive Dilemmas are at bottom identical, and like mixed hypothetical syllogisms, any form of the one may be converted to the corresponding form of the other by obverting the contrapositive of the major premise.[1]

The Rebutting of a Dilemma This consists of proving the falsity of a dilemmatic argument by means of another dilemma which seems to be equally cogent and proves an opposite conclusion

The rebuttal of a dilemma is possible because of the fallacious nature of a certain argument due to either there being no necessary connexion between the antecedent and the consequent, or the disjunction in the minor premise being not exhaustive

In rebutting a dilemma, the consequents of the major premise change places and their quality is changed For example,

If A is then C is, and if B is, then D is,

Either A is or B is,

Either C is or D is

---

[1] *Intermediate Logic*, p 256

This dilemma may be rebutted by another one.

> If A is, then D is not, and if B is, C is n(
> Either A is or B is,
> ∴ Either C is not, or D is not.

the conclusion of this being the opposite of the original conclusion.

We shall now give two well known examples of the rebuttal of a dilemma

(1) The one is that of the Athenian mother who advised her son not to enter public life, for, argued she·

> If you act justly, men will hate you; and if you act unjustly, the gods will hate you,
> But you must act either justly or unjustly,
> ∴ Either men will hate you, or the gods will hate you.

(and therefore you ought not to enter public life)

The son is said to have met the above argument by the following counter dilemma:

> If I act justly, the gods will love me, and if I act unjustly, men will love me,
> But I must act either justly or unjustly,
> ∴ Either the gods will love me, or men will love me.

(and therefore I must enter public life.)

Here in the original argument there is no necessary connection between one's acting justly (the antecedent) and one's being hated by men (the consequent)

(*ii*) The other story is that of Protagoras and his disciple Euathlus. Protagoras undertook to train Euathlus in law on condition that he would receive one half of the fee immediately and the other half when Euathlus won his first case. But as Euathlus did not take up any suit, Protagoras sued him and argued thus

'If you lose this suit, you must pay me by order of the court, and if you win it, you must pay me by our contract,

But you must either lose your suit or win it,

. You must pay me either by the order of the court or by your contract

To the above Euathlus retorted as follows —

If I lose my suit, I am free from payment by our contract, and if I win it, I am exonerated by the judgment of the court,

But I must either lose my suit or win it,

I must be free from payment either by our contract, or by the judgment of the court

Several suggestions have been made with regard to the fallacy in the above argument. The explanation offered by Prof Welton seems to be the most reasonable, viz, 'as Euathlus had until then won no case, the condition of the bargain was not fulfilled, and the judges should have decided in his favour. It was then open to Protagoras to bring a

fresh suit, when the judgment must have gone against Euathlus.'[1]

Dilemmatic Fallacies. Usually dilemmas are fallacious and the following are the chief fallacies:—

(1) Falsity of the Major Premise, i.e, there might be no real connection between the antecedent and the consequent.

(2) Fallacy of denying the antecedents, or affirming the consequents in the minor premise.

(3) The alternatives given in the minor premises may not be exhaustive.

HINTS AND EXAMPLES

1. Learn and remember the canons of each kind of mixed syllogism in order to test the validity of an argument

2 "In testing a dilemmatic argument the following method should be followed[2].—

(i) Each premise should be analysed into the constituent propositions

(ii) The constituent propositions should be combined to form the constituent syllogisms of the argument, and each syllogism tested by its rules

(iii) It should be noticed whether the conclusion of each syllogism is the same   If the conclusion is not the same, the argument is not a dilemma

The following may be taken as an example —

If A is, either B or C is,

---
[1] *Intermediate Logic,* p 259
[2] *Ray, A Text Book of Deductive Logic,* pp 206-207

Neither B is nor C is,
_____
A is not

This argument may be analysed as follows —

The *disjunctive* major premise is equivalent to

  (1) If A is, B is,

or (2) If A is, C is,

and the remotive minor premise is equivalent to

  (1) B is not,

and (2) C is not,

From both the premises of (1) we get the following syllogism

  If A is, B is,

   B is not,
   _____
  A is not

and from both of (2) the following

  If A is, C is,

   C is not,
   _____
  A is not

 Thus whichever of the two alternatives in the disjunctive premise be true, the conclusion is the same, viz , 'A is not'

 3 Only fallacious dilemmatic arguments can be rebutted In rebutting a dilemma the consequents of the major premise change places, and their quality is changed

QUESTIONS AND EXERCISES

 1 Give instances (not using symbols) of (*a*) a valid disjunctive syllogism, and (*b*) a fallacious hypothetical (conjunctive) syllogism   (A U , 1899)

 2 Give an example of a simple constructive and a simple destructive dilemma   State a rule for rebutting a dilemma, and illustrate it   (A U , 1901)

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3. Give, avoiding the use of mere letters, an instance of a destructive hypothetical syllogism. By what rule is the validity of hypothetical syllogisms tested? To what fallacies associated with categorical syllogisms would the violation of this rule correspond? Illustrate your answer by the syllogism already given (A. U, 1902).

4. State and illustrate the rules relating to those forms of reasoning in which one premise is hypothetical and the other categorical. (A. U, 1906)

5 Show by means of a concrete example the relation between the disjunctive, hypothetical and categorical forms of syllogism.

6. Give the rules of inference in hypothetico-categorical syllogism, and illustrate them by concrete examples (A. U., 1908)

7. Discuss the question whether in Logic we ought to regard the alternatives in a disjunctive judgment as mutually exclusive or not Show how the analysis of the disjunctive syllogism depends on the answer given to this question (A. U, 1909)

8. Construct a disjunctive argument of the form Every A is either B, or is not C, These A's are C, therefore, etc Reduce your concrete example to the conditional form, and the latter to a categorical syllogism

What is the name of the conditional form and of the mood of the categorical syllogism? (A U, 1918)

9. In a hypothetical syllogism show why it is wrong to argue from the affirmation of the consequent to the affirmation of the antecedent Illustrate your answer by a concrete example

10 Test the following, pointing out clearly what fallacy or fault, if any, is committed —'If all the theories of metaphysics were sound, some would be accepted by a majority of thinkers, but since none are accepted by a majority of thinkers none are sound' —(Questions on Logic)

11. How many forms of disjunctive syllogism are there? What is the canon for them? (Q L)

12   Explain what is meant by a dilemma in Logic   Does the following correspond to your definition? If he managed to escape he must have been either very clever, or very rich, but he was both stupid and poor, so he cannot have escaped   (Q L.)

13   What is meant by rebutting a dilemma? Invent a dilemma of the form   Neither if A, then C, nor if B, then D; Either C or D, therefore, either not A or not B, and rebut it (Q L)

14   Define dilemma   Construct a dilemma to prove that 'examinations are useless', and rebut it.   (Q L)

15   Reduce to syllogistic form and examine —

If there is no work to be had, a sea trip is out of the question. And so indeed it is   Therefore no work is to be had
16   How would you meet the following dilemma —

If there is censorship of the press, abuses which should be exposed will be hushed up; and if there is no censorship, truth will be sacrificed to sensation,

But there must be either censorship or not,

Either abuses which should be exposed will be hushed up, or truth will be sacrificed to sensation

(Logic Exercises)

17   Examine the following argument

When men are pure, laws are useless, when men are corrupt, laws cannot restrain them   Laws are therefore unnecessary (U I B , 1925)

18   Determine whether the following hypothetical arguments are valid or invalid   Express them in the categorical form, pointing out the categorical fallacy in each, if any —

(a) If a man is avaricious, he will be unhappy, but A is unhappy, and we may therefore conclude that he is avaricious

(b) If a student is intelligent, he will pass, but A cannot pass because he is not intelligent

19   Test the following arguments

(*a*) To give advice to people is futile. If you advise them to do what they already intend to do, advice is not needed; if you advise them to do what they have no mind to do, advice is ineffective. (U. I. B. 1927).

(*b*) If the population grows, wages tend to be lowered. In the United Provinces, the wages are low. Therefore, in the United Provinces the population has grown.

(*c*) All business that is ill-managed is unprofitable. All Railways are well-managed. Therefore, all Railways are profitable. (U. I. B., 1928).

20. Test the following.—

(*a*) Compulsory attendance at College lectures is absurd. If lectures are good, the boys will attend them without any compulsion, if they are not good, they need not be attended.

(*b*) If there were no criminals, there would be no police. But police is necessary in a civilised society. Therefore, criminals are necessary in a civilised society. (U. I B., 1929).

(*c*) Why should we fret about happenings that are not to our taste? If we can help them, we should manfully fight against them; if we cannot fight them, we should cheerfully endure them. (U. I. B., 1930).

CHAPTER VI
ABRIDGED AND COMPOUND SYLLOGISMS
1 ENTHYMEMES

Enthymemes are abridged forms of syllogism, one of the premises or the conclusion of which is not expressed. They are of three kinds —

(*ı*) *Of the First Order*—those of which the major premise is omitted, e g 'The inhabitants of India are liable to typhoid (the conclusion), for they live in a tropical climate (the minor premise)

Here the major premise, 'All those who live in a tropical climate are liable to typhoid', is omitted

(*ıı*) *Of the Second Order*—those of which the minor premise is omitted, e g , 'The Indians are liable to typhoid, for all who live in a tropical climate are liable to that disease '

(*ııı*) *Of the Third Order*—those of which the conclusion is omitted, e g , 'All those who live in a tropical climate are liable to typhoid, and the Indians live in a tropical climate '

It is to be noted that in ordinary discourse enthymemes are the usual forms of reasoning, for it is seldom that a complete syllogism is expressed

By an enthymeme Aristotle originally meant a syllo-

gism with probable premises. Later on the term acquired its present meaning, viz., an incomplete syllogism.

The way to make a syllogism complete by supplying the omitted premise has already been explained.

2. CHAINS OF REASONING

These are a series of syllogisms in which the conclusion of each syllogism provides a premise for that which follows. They are of two kinds:—

(a) *Progressive, Episyllogistic, or Synthetic Chain of Reasoning*—that in which the progress of thought is from a syllogism to another syllogism, the major or minor premise of which is the conclusion of the preceding syllogism.

For example.—

I	II
(1) All A is B, (Major)	(1) All A is C, (Major)
All C is A, (Minor)	All E is A, (Minor)
∴ All C is B. (Concl.)	∴ All E is C.
(2) All C is B, (Major)	(2) All C is D, (Major)
All D is C, (Minor)	All E is C, (Minor)
∴ All D is B. (Concl.)	∴ All E is D. (Concl.)
(3) All D is B, (Major)	(3) All D is B, (Major)
All E is D, (Minor)	All E is D, (Minor)
∴ All E is B. (Concl.)	∴ All E is B. (Concl.)

In Example I, the conclusion is the major premise, and in Example II, it is the minor premise of the next syllogism.

In a chain of reasoning the syllogism the conclusion of which forms a premise of the succeeding syllogism is called

a *Prosyllogism*, while the succeeding syllogism one of the premises of which is the conclusion of the preceding syllogism is called an *Episyllogism*

(*b*) *Regressive, Prosyllogistic, or Analytic Chain of Reasoning*—that in which the course of thought is backwards, that is from an episyllogism to a prosyllogism.

For example —
    (1) All E is B, (Concl)
    ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
         All D is B, (Major)
         All E is D, (Minor)
    (2) All D is B (Concl)
    ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
         All C is B, (Major)
         All D is C, (Minor)
    (3) All C is B (Concl)
    ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
         All A is B, (Major)
         All C is A, (Minor)

Such trains of reasoning, whether progressive or regressive, are often called *Polysyllogisms*

Progressive chain of reasoning is usually employed in Mathematics, and this is the method by which the consequences of general principles are exhibited It may consist of either categorical or hypothetical syllogisms

3 SORITES

This is a progressive chain of reasoning in which the conclusion of each of the prosyllogisms is omitted It is thus a kind of enthymeme

There are two kinds of sorites

(a) Aristotelian Sorites—a chain of reasoning in which the suppressed conclusions form the minor premise of the following episyllogisms, and the predicate of the last premise is, in the conclusion, affirmed or denied of the first subject, through one or more intermediate propositions. The following is an example:

> Every A is B,
> Every B is C,
> Every C is D,
> Every D is E,
> ∴ Every A is E.

This when analysed and expanded gives the following syllogisms:—

> (1) Every B is C, (major)
> Every A is B, (minor)
> ∴ [Every A is C] (concl.)
>
> (2) Every C is D, (major)
> Every A is C, (minor)
> ∴ [Every A is D] (concl.)
>
> (3) Every D is E, (major)
> Every A is D, (minor)
> ∴ [Every A is E] (concl.)

Special Rules of Aristotelian Sorites—These are the following:—

I—Only one premise, and that the last, can be negative.

II—Only one premise, and that the first, can be particular.

Proof of these rules:—

Rule I—Only one premise can be negative, for if there are two negative premises, in expanding the sorites there must be a syllogism with two negative premises which can yield no conclusion

Then, *only the last premise can be negative,* for if one of the premises in the chain of reasoning is negative, the conclusion of the last syllogism must be negative and so the major term, being the predicate, must be distributed Therefore, it ought to be distributed in the major premise But it can be distributed in the major premise only if it is negative. But this is the last premise of the sorites Therefore the last premise is negative

Rule II—Only one premise can be particular, for if there are two particular premises, in expanding the sorites, there must be a syllogism with two particular premises, which cannot yield any conclusion

Then *only the first premise can be particular,* for all the syllogisms of the sorites being in the First Figure, according to its special rules, their major premises must all be universal And as in expanding the sorites all the premises except the first are major premises of the constituent syllogisms, none of them except the first, which is the minor premise of the first syllogism, can be particular. In other words, only the first premise can be particular If any other premise except the first is particular, it would involve the fallacy of Undistributed Middle

(*b*) *Goclenian Sorites*—a chain of reasoning in which

the suppressed conclusions form the major premises of the following episyllogisms and the predicate of the first premise is, in the conclusion, either affirmed or denied of the subject of the last through one or more intermediate propositions. The following is an example·

> Every D is E,
> Every C is D,
> Every B is C,
> Every A is B,
> ∴ Every A is E.

This when analysed and expanded gives the following syllogisms:—

(1) Every D is E, (major)
Every C is D, (minor)
. [Every C is E] (concl)

(2) Every C is E, (major)
Every B is C, (minor)
.[Every B is E] (concl)

(3) Every B is E, (major)
Every A is B, (minor)
. [Every A is E] (concl.)

Special Rules of Goclenian Sorites —

—*Only one premise, and that the first, can be nega-*

II—*Only one premise, and that the last, can be parti-*
r.

Proof of these rules.
Rule I is proved in the same way as the first rule of .

the Aristotelian Sorites   If more than one premise is nega-
tive, in expanding the sorites, we must have a syllogism with
two negative premises which cannot yield any conclusion

Now if one premise is negative, the conclusion must
also be negative, and its predicate must be distributed. So
this term must be distributed also in the first premise, of
which it is the predicate   But this is possible only when the
premise is negative   Thus the first premise is to be negative

Rule II—If two or more premises are particular, in
expanding the sorites, there   could be a syllogism with two
particular premises which would not yield any conclusion.

Then, if any other premise except the last is particular,
the conclusion of the prosyllogism of which it is a premise
would be particular, which in its turn would be the major
premise of the episyllogism   But the syllogisms being in the
First Figure they must have a universal proposition for their
major premises, otherwise there will be the fallacy of Undis-
tributed Middle   Thus none but the last premise, which
does not form the major premise of any syllogism, can be
particular

Now in both the kinds of sorites the omitted conclusion
forms the premise of an episyllogism, which fact is charac-
teristic of progressive reasoning   Therefore it is wrong to
say, as some logicians have said, that the Goclenian Sorites is
a regressive form of reasoning

4 EPICHEIREMA

An epicheirema is a regressive chain of reasoning in

which one of the premises of each prosyllogism is omitted, and in which each prosyllogism furnishes a reason in support of a premise, or premises, of the episyllogism.

When only one premise of the episyllogism is thus supported, the epicheirema is *Single.*

When both the premises are furnished with reasons, the epicheirema is *Double.*

When those reasons in support of the premises have other reasons attached to them, the epicheirema is *Complex.*

Examples —

I   A *Single Epicheirema—*

'All A is B, and all C is A, because all C is D, therefore, All C is B,' which may be expressed thus·—

> All A is B, (major premise)
> All C is A, (minor premise)
> ∴ All C is B (concl.)

Now, the reason given for the minor premise is that 'All C is D,' which makes the following syllogism —

> All D is A, (the suppressed major premise)
> All C is D, (the reason given)
> ∴ All C is A.   (Ray's Logic)

II.   A *Double Epicheirema—*

> All A is B, because all A is G,
> All C is A, because all F is A,
> ∴ All C is B.

When expressed fully it consists of the following three syllogisms·

(1) All A is B,   (major)
All C is A,   (minor)
∴ All C is B.   (concl.)

The major premise 'All A is B' is proved by the following syllogism of which the major premise is suppressed —

(2) All G is B,   (the suppressed major)
All A is G,   (the reason given)
. All A is B   (concl)

The minor premise is proved by the following syllogism of which the minor premise is suppressed

(3) All F is A,   (the reason given)
All C is F (the suppressed minor)
All C is A   (concl)   (Ray's Logic).

III. *A Complex Epicheirema*

All A is B, because it is P, and every O is P
All C is A,
All A is B

Here while a reason is given to support the premise 'All A is B,' viz , that it is P, another reason is given to support that reason, viz , that O is P

The suppressed syllogisms are as follows —

(1) All P is B,
All A is P,
All A is B
(2) All O is P,
All A is O,
. All A is P

Concrete Examples —

I. *Single Epicheirema—*

All Europeans are white, and all Londoners are Europeans, because all Londoners are Englishmen, therefore, all Londoners are white, which may be expanded as follows —

    (1) All Europeans are white,

           All Londoners are Europeans,

    ∴ All Londoners are white.

The reason given for the truth of the minor premise is that 'All Londoners are Englishmen,' which with the suppressed premise makes the following syllogism —

    (2) All Englishmen are Europeans, (suppressed premise)

           All Londoners are Englishmen, (the reason given)

           All Londoners are Europeans,

II. *Double Epicheirema—*

    All Europeans are white, because all Europeans are those who live in a cold climate;

    All Londoners are Europeans, because all Englishmen are Europeans:

∴ All Londoners are white.

The above argument can be resolved into the following three syllogisms —

    (1) All Europeans are white,

           All Londoners are Europeans,

    ∴ All Londoners are white.

The major premise here 'All Europeans are white' is

proved by the following syllogism of which the major premise is suppressed —

(2) All those who live in cold climate are white,
(the suppressed major)
All Europeans are those who live in cold climate,
All Europeans are white

The minor premise in (1) is proved by the following syllogism of which the minor premise is suppressed —

(3) All Englishmen are Europeans, (the reason
given)
All Londoners are Englishmen, (the suppressed
minor).

All Londoners are Europeans

III *Complex Epicheirema—*
All Englishmen are white, (because all Englishmen
live in cold climate, and all Europeans
live in cold climate)
All Londoners are Englishmen,
· All Londoners are white
The suppressed syllogisms, are as follows —

(1) All those who live in cold climate are white,
All Englishmen are those who live in cold
climate,

All Englishmen are white
(2) All Europeans are those who live in cold climate,
All Englishmen are Europeans,
· All Englishmen are those who live in cold climate.

Thus an epicheirema is really a polysyllogism in which one, or more prosyllogisms, is incompletely expressed.

HINTS ON ENTHYMEMES

1. While dealing with an enthymeme always indicate the suppressed proposition or propositions.

2. In the Aristotelian Sorites the propositions have to be transposed in order to get syllogisms in the First Figure, while in the Goclenian Sorites any two consecutive propositions will make a syllogism in the First Figure

3   The following table, which we adopt from Dr Ray's Logic would make clear the different kinds of trains of reasoning.—

TRAINS OF SYLLOGISTIC REASONING

Synthetic, Progressive, or Episyllogistic (from Pro-to Epi-syllogism)
  - Fully Expressed → Aristotelian
  - Abridged (or Sorites) → Goclenian

Analytic, Regressive, or Prosyllogistic (from Epi-to Pro-syllogism)
  - Fully Expressed → Simple, Double
  - Abridged (or Epicheirema) → Complex

Aristotelian.	Goclenian,	Simple,	Double,	Complex,
All A is B,	All D is E,	with reason	with reasons	with reasons
All B is C,	All C is D,	for	for	for
All C is D,	All B is C,	one premise	both the	the
All D is E,	All A is B,	only	premises	reasons.
∴ All A is E	All A is E			

QUESTIONS AND EXERCISES

1. 'An epicheirema is an abbreviated chain of reasoning, consisting of an epi-syllogism with one or two enthymematic pro-syllogisms'

Fully explain this statement and illustrate by a concrete example (A U, 1910)

2 Express the following enthymemes in syllogistic form and reduce them to the First Figure —

(*a*) Spiders are not insects, for they have not six legs.

(*b*) Some water animals are mammals, since all whales are (A U, 1916)

3 Analyse and test the following trains of reasoning

(*i*) The free are happy, the courageous are free, the Americans are courageous, therefore the Americans are happy

(*ii*) Nay do not think I flatter,
For what advancement may I hope from thee,
That no revenue hast but thy good spirits,
To feed and clothe thee?

(*iii*) Some kings are politicians, all politicians are men, no man is perfect therefore some kings are not perfect

(*iv*) I cannot assist you, because I do not think it right to encourage beggars

4 Give concrete illustrations of enthymemes in all the three orders

5 Give an example of a regular sorites, and analyse it into its constituent syllogism (P U, 1918).

6 What do you understand by the distinction of the Aristotelian and the Goclenian forms of sorites? Give examples

7 Classify the following and examine their validity —

(*a*) Those who have shall not receive, those who do not receive do not want

(*b*) If the train is late, I shall miss my appointment, if it is

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not late, I shall miss it (the train): but either it will be late or not late, therefore, in any case, I shall miss my appointment.

8. Give the rules of the Goclenian Sorites and prove their validity.

9. Define and classify the various kinds of Trains of Reasoning. Give examples.

10. What is a sorites? Distinguish between the different forms of a sorites and show that in this kind of argument only one premise can be negative. What is the position of such a premise? How do you know? (U. I B., 1930).

11. Define and illustrate: Sorites, Enthymeme, Epicheirema, Prosyllogism. (N. U , 1927).

CHAPTER VII

INFERENCE IN INDIAN PHILOSOPHY

1 Definition of Inference

All the systems of Indian Philosophy discuss what they call the Means of Knowledge (*pramāṇas*), for according to them, an enquiry into the means of acquiring knowledge is an essential part of all philosophical thought Inference, (*anumāna*) is one of the Means of Knowledge, which has been recognised by all the schools of Indian Philosophy except the *Cārvāka* system which represents materialism and admits only perception as a valid means of knowledge. There is a whole literature in Indian Philosophy on the subject of inference, and it is impossible to enter here into all the details of the subject. We shall give presently what may be regarded as the most accepted account of knowledge by inference according to Indian philosophers

Inference may be defined as knowledge based upon a known invariable concomitance (*Vyāpti*) between the middle term (*linga*—a mark) and the major and the minor terms (*lingi*—those which bear the mark). It is therefore based upon previous perception (*pratyaksa*—direct knowledge). Invariable concomitance is invariable co-inherence of the predicate in the subject, and it is a connection which

requires no qualifying term or limitation (*upādhi*); e.g., the presence of fire wherever there is smoke. Fire is always concomitant with smoke, but smoke does not always co-exist with fire; and the proposition, 'wherever there is a fire, there is smoke' requires a qualifying condition (*upādhi*) that the fuel must be wet, which condition may or may not be fulfilled. Invariable concomitance is determined by an inductive process of reasoning which corresponds to the application of Mill's method of Agreement and Method of Difference. It is based up (*i*) the concomitance of affirmatives—that wherever the product exists, the material cause thereof exists; and (*ii*) the concomitance of negatives—that when the material cause does not exist, the product thereof also does not exist.

2. Classification of Inference and Parts of Syllogistic Reasoning

Inference is either (*a*) for oneself (*svārthānumāna*), or (*b*) for others (*parārthānumāna*). The inference for oneself consists of three steps as in the case of Aristotelian syllogism, and that for others consists of five steps including the five parts of syllogistic reasoning (*avayava*) are: (*i*) Proposition (*pratijñā*); (*ii*) Probans (*hetu*); (*iii*) Example (*udāharana*) (*iv*) Reodirmation or Application (*upanaya*); and (*v*) Conclusion (*nigamana*). These may be illustrated by means of an argument as follows:—

Sound is non-eternal,—(Proposition).

Because it is produced,—(Probans)
Whatever is produced is non-eternal, as a dish,—
(Example)

Sound is produced,—(Application)
It is non-eternal,—(Conclusion).

The above is an example of an argument in which the Example is similar to that which is to be proved—the probandum The following is an example of an argument in which the Example is dissimilar to the probandum —

Sound is non-eternal,—(Proposition)
Because it is produced,—(Probans).
Whatever is not produced is eternal, as the spirit,—
(Example).
Sound is not that which is not produced,—
(Application).
It is non-eternal,—(Conclusion)

Both the above arguments are examples of inference for others, that is to say, of one which is meant to convince another person of the truth of the conclusion. The inference for oneself consists of only three steps as follows·—

All that is produced is non-eternal,
Sound is produced,
Sound is non-eternal

The various parts of a syllogism may be defined as follows —

(1) *Proposition* (*pratijñā*) is that in which an assertion is made about that which is to be proved—the probandum.

(*ii*) *Probans* (*hetu*) is that which proves the proban-dum through its similarity or its dissimilarity to a knowr example.

(*iii*) Example is a familiar instance which, either through similarity to the probandum, has a property which belongs to it, or, through dissimilarity to the probandum, doe: not have a property which belongs to it.

(*iv*) *Reaffirmation or Application* (*upanaya*) is that which on the basis of the Example reasserts the subject as 'be-ing so' or as 'being not so'; that is to say as being possessed of the character which has been found in the Example to be con-comitant with the probandum; or as being not, possessed of the character which has been found in the Example to be concomitant with the negation of the probandum. Thus there are two kinds of Reaffirmation based upon two kinds of Example.

(*v*) *Conclusion* is the restatement of the Proposition on the basis of the statement made in the Probans. "The Probans having been stated either per similarity or per dis-similarity, we have a recapitulation of the entire reasoning in accordance with the Example, and this recapitulation constitutes the final conclusion, which is in the form 'There-fore, having the character of product, sound is non-eternal'. This has been called '*nigamama*', because it serves to connect or string together the Proposition, the Probans, the Example, and the Reaffirmation."[1]

An example of each of the above parts of syllogism is to be found in the two arguments given above.

Inference has also been divided into Positive Inference (*vīta*) and Negative Inference (*avīta*) by Vācaspati Miśra in his *Sāmkhya-tattva-kaumudī* Positive Inference is that which is based upon an observed positive concomitance of the major and the middle terms; and Negative Inference is that which is based upon their negative concomitance.

Positive Inference (*vīta*) has been further sub-divided into Antecedent Inference (*pūrvavat*) and Inference by Generalisation (*sāmānyatodṛṣta*). The former is based upon an observed concomitance of the major and the middle terms by means of previous perception, e g, of smoke and fire. The latter is an inference about super-sensible objects like the soul or the senses on the basis of an analogy to the relation between other objects known through perception; e g, the inference that the senses must exist because of the functions of hearing, seeing, smelling, etc, for these require a cause as any other effect, e g, the cutting of a tree does.

Negative Inference (*avīta*) is based upon the absence of concomitance between the major and the middle terms. For example, cloth (the effect) is non-different from the threads (the cause), for the former inheres in the latter, for if the two were different from each other, there would be no inherence between the two, as, for instance, there is none between a cow and a horse, who are different from each other. Negative Inference has also been called S'*esavat* in Sanskrit terminology.

The arguments according to Positive Inference, and Negative Inference can be put into the form of a Hypothetical—categorical syllogism, the conclusion being derived, in the case of Positive Inference, by affirming the antecedent; and, in the case of Negative Inference, by denying the consequent:

Positive Inference.

If there is smoke on the hill, there is fire on it,
There is smoke on the hill,
∴ There is fire on it.

Negative Inference.

If cloth and the threads were different, cloth would
                              not inhere in the threads,
But cloth does inhere in the threads,
∴ Cloth and the threads are not different.

3. FALLACIES

A fallacious reasoning is defined as that in which the Probans does not possess the characteristics of a true Probans, and yet is sufficiently similar to the true Probans to appear as such. The following are the main fallacies due to a false Probans[1]:—

(1) *Inconclusive Reasoning (Savyabhicāra)* in an argument which is vitiated by indecision or uncertainty. 'For example, in the argument 'Sound is eternal, because it is intangible, for tangible things, as the jar, etc., are non-eternal,'

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[1] The following definitions and examples are adopted from my *Introduction to Indian Philosophy* pp 82-85

we find that the character of intangibility has been put forward in order to prove the character of eternality, while, as a matter of fact, the two characters do not bear to each other the relation of proof and that which is proved, as all non-eternal things are not tangible, for example, intellect (*buddhi*) is non-eternal, and yet it is intangible, and an action, although tangible, is yet eternal. The argument will make the following Aristotelian syllogism vitiated by the Fallacy of Undistributed Middle —

> Some intangible things are eternal (as the soul etc,),
> Sound is intangible,
> . Sound is eternal.

(*ii*) *Contradictory Reasoning* (*viruddha*) is that argument which contradicts or sets aside an admitted fact or doctrine The *Bhāsya* on the *Nyāya-sūtras* cites an example from the *Yoga-bhāsya* on the *Yoga-sūtra*, III, 13 It is stated that (*a*) This world, being a modification, ceases to manifest itself, because its eternality is denied, and (*b*) Even when it thus ceases, it continues to exist, because its utter destruction is denied. Here we find that the first statement is contradicted by the second in that while the one denies eternality to all that which is a modification, the other admits the possibility of the continuance of that which is a modification
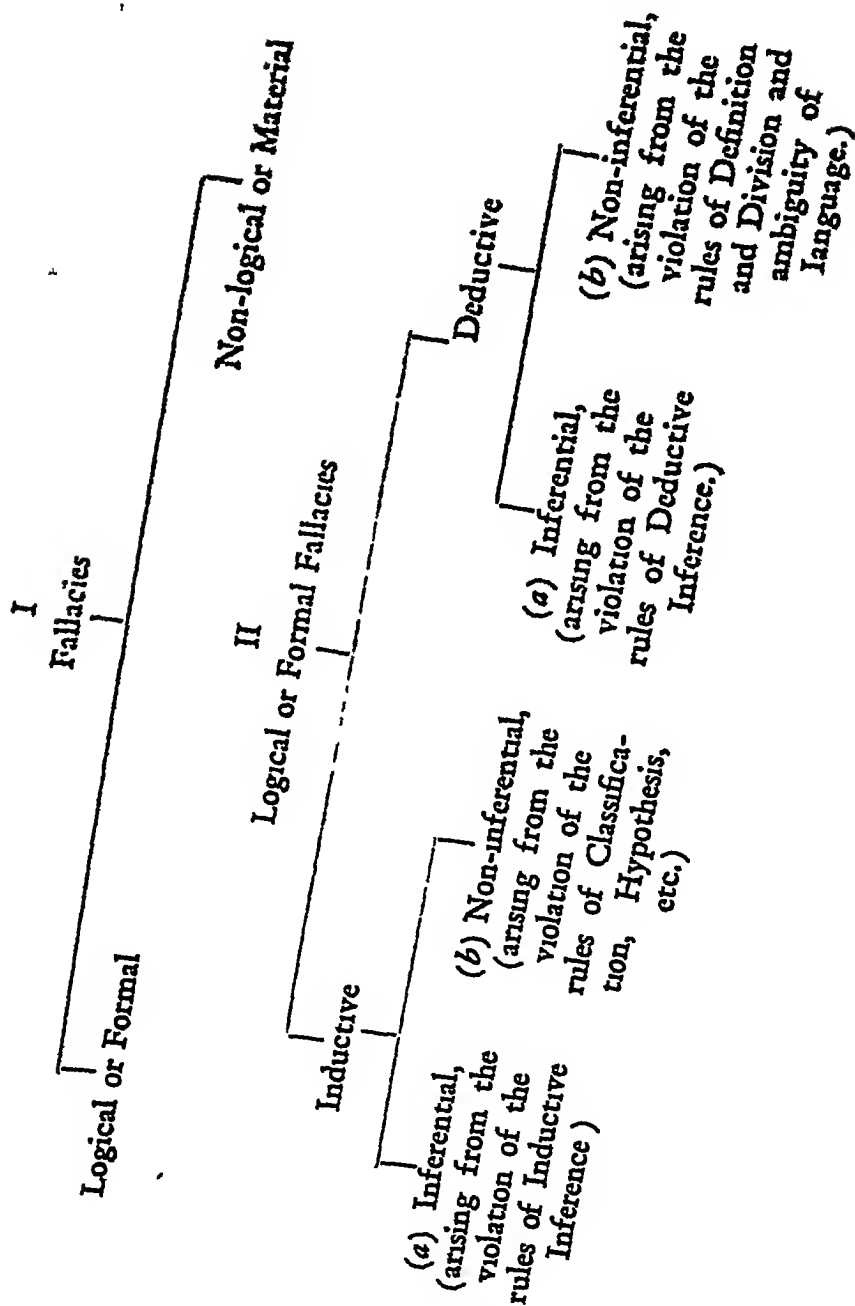
(*iii*) *Neutralised Reasoning* (*Prakaranasama*) is that in which the Probans which is put forward to establish a definite conclusion only give rise to suspense in regard to the point at issue For example, 'Sound is non-eternal, because we do not find in it the properties of an eternal thing, and we have found

PART V
FALLACIES

FALLACIES

1   DEFINITION AND CLASSIFICATION

A fallacy, taken in its widest sense, may be said to be the violation of any of the rules of thought. A distinction is often made between the Logical Fallacies and the Non-logical or Material Fallacies, the former term being used to denote all those errors which are due to the violation of the formal rules of Definition and Division, and also of Immediate and Mediate Inference, and the latter to denote those fallacies which are due, not to the violation of any formal rules, but to some kind of fault in the matter of thought. Hence the name 'Material Fallacies' as distinguished from the former which have also been called 'Formal Fallacies' The Logical Fallacies might be further either deductive or inductive. Here we shall deal only with the deductive fallacies, which may be classified as follows —

INTERMEDIATE LOGIC, DEDUCTION

Fallacies

I
Logical or Formal

II
Non-logical or Material

Logical or Formal Fallacies

Inductive

(a) Inferential (arising from the violation of the rules of Inductive Inference)

(b) Non-inferential (arising from the violation of the rules of Classification, Hypothesis, etc.)

Deductive

(a) Inferential (arising from the violation of the rules of Deductive Inference.)

(b) Non-inferential (arising from the violation of the rules of Definition and Division and ambiguity of language.)

(a)

Deductive Inferential Fallacies

(i) Fallacies of Immediate Inference

Of Conversion
" Obversion
" Obverted Conversion
" Contraposition
" Obverted Contraposition
" Inversion
" Obverted Inversion, and, according to some logicians, also of inferences by Opposition

(ii) Fallacies of Mediate Inference

I—Syllogistic —
Of Undistributed Middle
" Illicit Process
" Four Terms.
etc., etc

II—Non-syllogistic Fallacies

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(b)

Deductive Non-inferential Fallacies

(i) Fallacies of Definition and Division, such as too narrow or too wide definition, obscure definition, cross Division, overlapping division, etc., etc.

(ii) Semi-logical Fallacies, or those due to the ambiguity of language such as:
Ambiguous Middle.
Fallacy of Composition.
" " Division.
" " Accident.

III

Non-logical or Material Fallacies

(i) *Petitio Principii.*
(ii) *Non-Causa pro causa* (premises unduly assumed).

(iii) Irrelevant Conclusion,
or
Ignoratio Elenchi (the conclusion being not to the point.)

Now we shall take up each of these kinds of fallacies and explain them in detail

2. LOGICAL FALLACIES

There are two kinds of these (*a*) Inferential Deductive Fallacies, and (*b*) Non-inferential Deductive Fallacies.

(*a*) *Inferential Deductive Fallacies* are again of two kinds.

(*1*) *Fallacies of Immediate Inference* due to the violation of the rules of the various kinds of eductions and also, according to some logicians, to the faults of the so-called inferences by the Opposition of Propositions. The various processes and their rules have already been explained, and need not be repeated here.

(*11*) *Fallacies of Mediate Inference,* which might be either (1) Syllogistic, or (2) Non-Syllogistic Here we have to deal chiefly with the first of these

Syllogistic Fallacies are due to the violation of any one, or more, of the rules of syllogistic inference The following are thus the possible fallacies —

(1) *The Fallacy of Four Terms*—arising from the violation of *the First Rule*

(2) *The Fallacy of Four Premises*—arising from the violation of *the Second Rule.*

(3) *The Fallacy of Undistributed Middle*—from the violation of *the Third Rule*

(4) *The Fallacies of Illicit Major and Illicit Minor*— from the violation of *the Fourth Rule.*

(5) *The Fallacy of Two Negative Premises*—from the violation of *the Fifth Rule.*

(6) *The Fallacies of Negative Conclusion from Affir mative Premises and an Affirmative Conclusion from Negative Premises*—from the violation of *the Sixth Rule.*

(7) *The Fallacy of Two Particular Premises*—from the violation of *the First Corollary.*

(8) *The Fallacy of a Universal Conclusion when one of the Premises is Particular*—from the violation of *the Second Corollary.*

(b) *Non-inferential Deductive Fallacies.* These are
    (i) Fallacies of Definition and Division, and
    (ii) Semi-logical Fallacies.

(i) *Fallacies of Definition and Division.* These have already been explained in the chapters dealing with Definition and Division, and do not require any separate treatment here.

(ii) *Semi-Logical Fallacies* These arise from the ambiguity of language, and are as follows:—

(a) *The Fallacy of Four Terms* due to the ambiguity of a certain term which is really equivalent to two terms. When it is the middle term which is ambiguous, the error is known as *the Fallacy of Ambiguous Middle.*

For example,

Light is a mode of motion,

Feather is light,

. Feather is a mode of motion—(*Ray*).

Here it is evident that the middle term is ambiguous.

(*b*) *The Fallacy of Composition*,—when in a syllogism the middle term is taken distributively in the major and collectively in the minor premise.

For example,

> All the angles of a triangle are less than two right angles,
>
> ABC, ACB & BAC are all the angles of a triangle,
>
> They are less than two right angles

Here the word 'all' which forms a part of the middle term is ambiguous   It is taken distributively in the major premise and collectively in the minor   However, if we take 'all' distributively in the minor premise also, the argument is valid

(*c*) *The Fallacy of Division*,—when in a syllogism the middle term is taken collectively in the major and distributively in the minor premise

For Example,

> All the angles of a triangle are equal to two right angles,
>
> ABC is an angle of a triangle,
>
> ABC is equal to two right angles

Here the middle term is taken collectively in the major and distributively in the minor premise.

(d) *The Fallacy of Accident,*—when in a syllogism a certain term is interpreted simply, i.e., without any condition in one premise, and as modified by certain accidents in the other. This fallacy includes both (1) *the Fallacia a dicto simpliciter ad dictum secundum quid,* i e , the fallacy of arguing from a simple statement to a statement under a certain condition, and (2) *the Fallacia a dicto secundum quid ad dictum simpliciter* i.e , the fallacy of arguing from a statement under a certain condition to a simple statement. The latter is also known as *the Converse Fallacy of Accident.*

For example,

(1) All who thrust a knife into another's person are guilty of crime,

All surgeons are those who thrust a knife into another's person,

∴ All surgeons are guilty of crime.

Here we have the fallacy of accident, for we argue from a simple statement to a statement true under certain conditions. For the use of a knife by a surgeon for the purpose of an operation is different from the use of it by an offender for the purpose of doing hurt to a person

(2) All surgeons are allowed to cut a part of one's body if necessary; therefore, this gentleman, who is a surgeon, can cut a part of any one's body (for example, of his enemy) if he thinks it necessary.

(e) *Amphiboly or Ambiguity of Structure*—when a statement admits of more interpretations than one because of the ambiguity of its construction

For example,

(1) 'The Duke yet lives that Henry shall depose' which may mean either· (*a*) Henry shall depose the Duke, or (*b*) The Duke shall depose Henry.

(2) 'Pyrrhus, the Romans shall, I say, subdue' which also may mean either of the two (*a*) Pyrrhus shall subdue the Romans, (*b*) The Romans shall subdue Pyrrhus.

Such ambiguous utterances are characteristic of prophecies such as were made, for example, by the Oracle at Delphi.

(f) Fallacy of Accent—when we emphasise a wrong word in speech or writing and thus change or distort the original meaning of a sentence Let us take the most popular example 'Thou shalt not bear false witness against thy neighbour.'

This injunction means different things according as the different words in it are emphasised

> (*i*) Thou shalt not bear *false* witness against thy neighbour.
>
> (*ii*) Thou shalt not bear false witness *against* thy neighbour.
>
> (*iii*) Thou shalt not bear false witness against *thy* neighbour.

(*iv*) Thou shalt not bear false witness against thy neighbour.

(g) *Fallacy of Figure of Speech*—this arises from a confusion of grammatical forms. Words derived from the same root but having different significance are used as if they had the same meaning.

For example,

All creditors are unhappy,

Lakshman is a man of credit,

∴ Lakshman is unhappy—(Dewanchand).

Here 'creditors' and 'a man of credit' mean different things.

It would be noticed that most of the fallacies under Semi-logical Fallacies are ultimately due to *the ambiguity of the middle term*

3. NON-LOGICAL OR MATERIAL FALLACIES

As already explained, these are such errors of reasoning as are due not to the violation of any of the formal rules of logical processes but to a fault in the matter of thought itself. Hence the name 'Material Fallacies'. The following are the important forms:—

(1) *Petitio Principii,* in the stricter sense, may be defined as a fallacy in which the conclusion is the same as, or is already included in, one of the premises of a syllogism. In this sense it is also called *the Fallacy of Argument in a Circle,* for the argument really comes back whence it starts: what is said in the conclusion is the same as contained in one

of the premises.   In the wider sense, it may be defined as a fallacy in which the conclusion and one of the premises are interdependent for their proof.   That is to say, while the conclusion depends upon one of the premises for its proof, the premise itself depends upon the conclusion for its proof In this sense the fallacy is also known as *Begging the Question*.

An example of the Argument in a Circle·

Cold contracts things because it is the effect of cold that the particles of matter are drawn together.   The fallacy of this form is also called *hysteron proteron.*

An example of Begging the Question·

"You ought to submit to the guidance of himself, or his leader, or his party, etc., because these maintain what is right; and these maintain what is right, because it is maintained by persons whom you ought to submit to, and these are himself and his party "[1]

Some logicians maintain that every syllogistic argument is a case of *Petitio Principii*   This doctrine we shall examine presently at the end of this chapter

(*ii*) *Non-Causa pro causa or False Cause* is   really   an inductive fallacy, where a false cause, a mere sign or antecedent, is regarded as the cause of an event   It is also called *Post hoc ergo propter hoc*—after this, and therefore, on account of, or caused by, this.

For example, one might argue that the first sight of a

_____
[1] Whately's *Elements*, 9th Edition, p 132, also quoted in   Ray's *Deductive Logic*

certain man in the morning was the cause of his loss of money during the day, or the screech of an owl near one's house was the cause of a certain calamity to the family.

(*iii*) *Irrelevant Conclusion or Ignoratio Elenchi*, where the conclusion arrived at, or the argument advanced is beside the point; in other words, where the premises do not lead to the conclusion desired to be established.

For example, should one want to refute a certain religious or political doctrine, instead of discussing it on its own merits, one might attack the character of the person, or persons, who preaches it, or point to the meagre following which it might have secured.

The following are some of the forms of this fallacy:—

(*i*) *Argumentum ad hominem*—where the character and actions of a person are attacked in order to refute a certain argument. For example, one might say that a man's advice not to gamble cannot be accepted, for he was a spendthrift.

(*ii*) *Argument ad populum*, where an appeal is made to the common prejudices of the people. For example, a man might oppose the introduction of women's education on the ground that no one would like the ladies to be able to write letters to any body they liked, or claim the right of more freedom and equality with men.

(*iii*) *Argumentum ad vercundium*—where an appeal is made to a person's reverence in order to claim authority for some custom or principle For example, respect for certain

established customs is claimed by appealing to the reverence due to one's fore-fathers or teachers Some one might argue that the purdah system is good, for it was observed by some of the most respected ladies of one's community.

(*iv*) *Argument ad ignorantiam*—an appeal to the ignorance of one's opponent Some one might say that the truth of the doctrine of Eternal Condemnation is too abstruse to be understood by men of ordinary acquirements such as his opponent might be

(*v*) *Argumentum ad baculum*—an appeal to force instead of an effort to convince the opponent by means of an argument It sometimes happens, especially, in religious discussions among very orthodox people, that when the two parties cannot convince each other by argument they resort to violence This kind of action can in no way be called a logical fallacy, although it has been the practice to regard it as such.

4 OTHER FALLACIES

Two other fallacies might be explained

(1) *Fallacy of the Consequent or the Non-Sequitur*—where the conclusion does not at all follow from the premises, where, in fact, there is no logical connection between the premises and the conclusion For example, one might argue that he must be given money, for he is a young man of thirty-two

(2) *Fallacy of Many Questions or of Complex Question*—where certain questions are already based upon certain

assumptions, which might require proof. The classical ex
ample is 'Have you left off beating your mother'?, which
question is based upon the assumption that the person to
whom the question is put was in the habit of beating his
mother In what subjects have you failed? Why have you
not returned my book? These are other similar questions
which assume failure or the borrowing of a book.

5. THE VALIDITY OF SYLLOGISTIC INFERENCE

It was as early at the Third Century when Sextus Empiri-
cus objected to the validity of syllogistic inference on the
ground that the major premise of a syllogism is obtained by a
complete testing of every instance that can come under it, and
therefore to draw a conclusion about an individual fact from
a general principle is to argue in a circle The same objections
has been raised with regard to the validity of syllogism by Mill,
Sir John Herschel, Dr. Whewell, Professor Bain, and others A
quotation from Mill will make the nature of the objection
clear He says 'It must be granted that in every syllo-
gism, considered as an argument to prove the conclusion,
there is a *petitio principii* When we say 'All men are mortal,
Socrates is a man, therefore, Socrates is mortal,' it is un-
answerably urged by the adversaries of syllogistic theory,
that the proposition 'Socrates is mortal' is presupposed in the
more general assumption 'All men are mortal', that we can-
not be assured of the mortality of all men, unless we are
already certain of the mortality of every individual man,
etc., etc, that, in short, no reasoning from generals to par-

ticulars can as such prove anything, since from a general principle we cannot infer any particulars but those which the principle itself assumes as known

Now it might be pointed out *firstly*, that the objection contained in the above quotation is based upon the assumption that the general statement or principle contained in the major premise is arrived at by a complete enumeration of particular instances. For only in that case could we say that every general proposition with which we start in a syllogism already presupposes a consideration of all the particulars that can be subsumed under it. But we know from the principles of inductive reasoning that this view of the nature of a general principle or statement is not necessarily correct. The general principle does not necessarily presuppose all the particular instances. For example, the general statement 'All men are mortal' does not presuppose every particular instance of men who are yet to die although it is applicable to each of those cases. *Secondly*, the objection involves the assumption that the conclusion of a syllogism is derived only from the major premise and the minor premise is superfluous. We know, however, that the conclusion is derived by a combination of both the premises. *Thirdly*, while it might be admitted that to some who have already followed the argument contained in a particular syllogism, the conclusion might be known to be present in the major premise, to others who are not acquainted with the reasoning it cannot be so. *Fourthly*, even when we

know what is said in the conclusion to be true, the syllogistic inference is of value in helping us to see for ourselves how that is proved, and in convincing others of its truth. Hence the value and validity of syllogism.

HINTS AND EXAMPLES

1. In order to test the validity of a logical argument put it into its proper logical form, and then apply the rules concerned. The way to put an argument into a proper logical form has been explained in the various chapters concerned, and the rules have also been given

2. While testing a syllogistic reasoning take care to frame correct premises and conclusion. This is done by starting with the conclusion and then framing the major and the minor premises with the major, the minor and the middle terms as explained already.

3. If there is any error, point out the fallacy and also give your reasons briefly

4. If the argument is syllogistic, you can check your results with regard to its validity or otherwise by referring to the valid moods in the various figures

Examples of various kinds of arguments and the fallacies to which they are liable have already been given in the chapters concerned

QUESTIONS AND EXERCISES

1. What do you understand by a fallacy? Should Logic include discussion of fallacies, and if so, why?

Explain clearly what is meant by (a) Fallacy of Division, (b) Fallacy of Accident, and give an example of each (A U, 1911)

2 Arrange the following arguments in logical form and criticise them:—

(*a*) If education is popular, compulsion is unnecessary, if unpopular, compulsion will not be tolerated

(*b*) In a lottery it is improbable that any particular person will draw the prize But some one must draw the prize Therefore something improbable is bound to happen

(*c*) I cannot accept your doctrine as true, for it seems to me that its general acceptance would be attended with the most injurious consequences to society (A U, 1911)

3 What do you understand by a fallacy? Explain the nature of the following fallacies, giving an example of each (*a*) Fallacy of Division, (*b*) Fallacy of Composition, (*c*) *Petitio Principii* (A U, 1912)

4 Arrange any three of the following arguments in logical form and estimate their validity —

(*a*) If a child is spoilt, he is always unhappy, for all spoilt children are selfish

(*b*) Improbable events happen every day But what happens every day is a very probable event. Therefore, improbable events are very probable events

(*c*) If a man is educated, he finds manual labour distasteful Consequently, if education is universal, industry will cease

(*d*) Giving advice is useless—for either you advise a man to do what he already intends doing, in which case your advice is superfluous,—or else you advise him to do what he does not mean to do, and the advice is ineffective (A. U, 1912).

5 Criticise the following arguments, indicating what fallacy, if any, is illustrated by each —

(*a*) Food which is not cooked is not wholesome, this food is not cooked, therefore it is not wholesome

(*b*) The formal study of Logic is useless, for many persons who have never studied Logic can reason shrewdly and accurately

(*c*) The people of the country are suffering from famine, and as you are one of the people of the country, you must be suffering from famine

(d) We must reject the advice of this man, for his character is not good

(e) It is foolish to tell a lie, for honesty is the best policy. (A U, 1913)

6 Examine the logic of —

(a) An atom is an indivisible portion of matter

(b) Every rule has an exception

(c) It is good to have a holiday The longer the vacation the better

(d) There is always sure to be a good crop, if there is a good monsoon We are to conclude, therefore, that these districts will suffer severely, for there has been no rain

(e) What is the good of all this education? Every day you hear of a crime that would never have been committed if its author had never learnt to read or write

(f) If all the sons and daughters of the motherland were always content to be carried along the line of least resistance, we should never have any progress at all But if a country is to have a future, there is bound to be progress It is, therefore, obvious that none of the sons, or daughters either, of any country that has a future before it can afford to continue to be carried along the lines of real resistance (A U, 1914)

7 Put into strict logical form and criticise the validity of the following arguments, pointing out the fallacy, if any —

(a) I must either starve or go to prison, for if I don't steal this loaf, I shall starve, and if I do steal it, I shall be sure to be caught by the police

(b) This must be a good book, because it has such a large sale

(c) You'll know better when you grow older

(d) All wealth is produced by labour, therefore all wealth ought to go to the working classes

(e) John Brown is the best student in England, for he is the

best student in Branzenface College, which is the best college in Cambridge University, which is the best university in England

(*f*) When did you leave off playing the fool? (A U, 1915)

8 Explain the logical nature of the following arguments, naming any fallacies that are involved —

(*a*) The prisoner's guilt is proved by his trying to prove an *alibi*, which is what guilty men always do

(*b*) I shall not succeed because I am not self-seeking

(*c*) You have no right to say that my subscription is small, for you yourself have contributed nothing

(*d*) The English are a free people Therefore, no Englishman is ever in prison

(*e*) If we are to believe philosophers, knowledge is impossible, for some tell us we can know nothing of matter, and the rest that we can know nothing of mind

(*f*) It is right to give to beggers, because charity is a virtue

(*g*) Those who assert that medical treatment is useless to the sick are self-deceived, or else, deceivers of others, according as they do or do not believe their own assertions

(*h*) It is for the benefit of society that laws should be enforced Criminals are the occasions of laws being enforced, and are consequently public benefactors

(*i*) The drinking of alcohol should be prohibited by law, since it is the cause of poverty and misery

(*j*) Punishment is useless, the good do not need it, and the bad are unaffected by it (A U, 1916)

9 Examine the following arguments naming any fallacies that may be involved —

(*a*) It is the business of the state to enforce all right, charity is right, and should therefore be enforced by the state

(*b*) Few men die over eighty, I am over eighty, and therefore shall probably not die

20

(c) No one was ever improved by being punished, since punishment is essentially degrading

(d) Grass is green, and green is a colour. Therefore grass is a colour

(e) War is an appalling evil, and therefore men ought not to be trained to the use of arms.

(f) I cannot accept your doctrine as true, for it is evident that its general acceptance would be attended with the most injurious consequences to society   (A U, 1917)

10. Examine any *five* of the following arguments naming any fallacy which may be involved

(a) It can be shown that the weavers of India would be benefited by Protection, similarly the shoe-makers and every other trade, therefore Protection would be a benefit to India

(b) Every planet moves round the sun, Jupiter moves round the sun, therefore Jupiter is a planet

(c) War is productive of evil, therefore peace is likely to be productive of good

(d) The prisoner pleads he did not steal the goods   But why, I ask, did he hide them, as no thief fails to do?

(e) When a man is educated he does not wish to work with his hands, therefore if education were universal, industry would cease

(f) Nothing is heavier than platinum, feathers are heavier than nothing, therefore, feathers are heavier than platinum

(g) A is 5 miles north of B, C is five miles east of B, therefore C is south-east of A.   (A U, 1918)

11 Examine any *five* of the following arguments completing them where necessary, and pointing out any fallacies which may be involved —

(a) In this district a much larger percentage of female candidates passed their examinations than male candidates, therefore the young women of this district are more intelligent than the young men.

(*b*) I am sure that Rama did this, for only mischievous boys act in this fashion, and Rama is the most mischievous boy in the school.

(*c*) If all students were clever there would be no need for examinations, but alas, many are stupid, and so examinations cannot be abandoned

(*d*) You say that only Tories advocate Tariff Reform He must be Liberal, then, for he opposes Tariff Reform

(*e*) Since the construction of the Suez Canal Great Britain has had continual trouble in Egypt, therefore this canal is the source of the trouble

(*f*) What would our ancestors say to this measure? How does it agree with their experience? Are we to put the wisdom of yesterday in competition with the wisdom of centuries? (A U, 1919)

12 Examine five of the following arguments, completing them where necessary and pointing out any of the fallacies which may be involved —

(1) A person who passes his examination may be clever, this candidate has passed his examination, therefore he is clever

(2) If I should ever grow desperate and kill myself I will not choose Friday, because Friday is an unlucky day and will bring me unhappiness

(3) No telegrams are good news for all telegrams are news, and no news is good news

(4) The working classes would be greatly benefited by this measure Consequently those who oppose it are enemies of the people

(5) Men of full age and ordinary intelligence are surely capable of concluding a bargain for themselves without government interference, therefore there is no need to fix the scale of fares for hired carriages

(6) Those who beg for concessions in hesitating language do not really feel the need they profess, those who demand them with threats are unfit to enjoy the privilege they so rudely claim But all

requests must be made in *temperate* or *intemperate* language There-
fore all must be resisted or all must be conceded

(7) No one could possibly believe a story obviously unworthy
of credence

(8) A is next to B, B is next to C, therefore A is next but one
to C (A. U., 1920).

13 Examine any *five* of the following arguments pointing
out and naming the fallacies, if any —

(*a*) If their *theories* were *sound*, philosophers would agree
among themselves

(*b*) Good men write good books, this is a good book, and
therefore its author must be a good man

(*c*) No man wishes to suffer pain, your friend cannot be cured
without suffering pain, and therefore will not wish to be cured

(*d*) If he is not guilty, why did he try to escape as guilty men
always do

(*e*) The explosion was obviously due to gunpowder, as nothing
else possesses sufficient force

(*f*) In giving advice, you either advise a man to do what he
already intends to do, in which case your advice is superfluous, or
you advise him to do what he is resolved not to do, in which case
the advice is ignored

(*g*) Not all educated persons *spell correctly*, for spelling mis-
takes frequently occur in the papers of Intermediate candidates
(A U , 1922)

14 Put any five of the following arguments in logical form,
and examine their correctness —

(*a*) The student must be industrious, for he has passed the
examination

(*b*) I shall be appointed to the post, for I am a graduate and
only graduates will be appointed to the post

(*c*) To assault another is wrong, consequently, a soldier who
assaults the enemy does wrong.

(*d*) All liars are cowards, therefore, Caius is a liar, for he is a coward

(*e*) He is fever-stricken, for he is thirsty, as all fever-stricken patients are

(*f*) The moon goes round the earth, the earth goes round the sun, therefore, the moon goes round the sun

(*g*) Unsuccessful candidates are generally indolent, John, therefore, must be indolent, since he is an unsuccessful candidate

(*h*) Only the virtuous are happy, therefore, he cannot be virtuous, for he is not happy   (N U, 1928)

15   Examine *any five* of the following arguments, carefully analysing each and pointing out fallacies, if any   Merely mentioning the technical names of the fallacy will receive no credit —

(*a*) Good workmen do not complain of their tools, my pupils do not complain of their tools, therefore my pupils are good workmen

(*b*) All thieves are dishonest, all dishonest persons are immoral, some immoral persons are not punished, therefore some thieves are not punished

(*c*) All intelligible propositions are either true or false The two propositions 'the college will be closed tomorrow' and 'the college will not be closed tomorrow' are both intelligible propositions   Therefore, they are both true or both false

(*d*) John is my friend, and James is a friend of John Obviously, James is my friend

(*e*) Why should we fret about happenings that are not to our taste? If we can help them, we should manfully fight against them, if we cannot fight them, we should cheerfully endure them

(*f*) What can be affirmed of a whole can certainly be affirmed of a part included in the whole   The entire population of India is about 33 crores   Therefore, the population of the United Provinces, which is a part of the Indian population, is about 33 crores

(*g*) *Brutus*—Who is here so vile that will not love his country? If any, speak, for him have I offended   I pause for a reply
Citizens—None, Brutus, none
Brutus—Then none have I offended   (U I B, 1930)